Geochemistry Of The Lathrop Wells Volcanic Center

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The purpose of this report is to present in a single reference all geochemical data obtained from the Lathrop Wells center to date and to describe the basic characteristics of the data. Modeling of the geochemical data to determine the origin of magmas and magmatic evolution of the Lathrop Wells center will be completed in FY96. Sampling, analysis, and correlation of ashes from trenched fault exposures will be completed in FY95.

Overview and Sampling Strategy of the Lathrop Wells Volcanic Center

The Lathrop Wells volcanic center is located approximately 20 km south of the potential Yucca Mountain repository immediately north of interstate highway 95 (Fig. 1). Field, geomorphic, geochronologic and trenching studies have led to the conclusion that the Lathrop Wells center formed during four main eruptive episodes separated by significant periods of inactivity (Fig. 2). Field evidence of significant gaps in eruptive activity between major eruptive episodes includes development of soil horizons, erosional unconformities, and differences in the degree of geomorphic preservation of eruptive features (Crowe et al., 1994). Each of the four major eruptive episodes at Lathrop Wells is defined as a *chronostratigraphic unit*, and contains one or more *eruptive units* (a volcanic deposit [lava flow or scoria fall] formed during a single time-synchronous volcanic eruption).

Chronostratigraphic unit I is the oldest eruptive episode and includes four lava flows (Ql1a-d) erupted from multiple, north to northwest-trending fissure zones marked by scoria and spatter deposits (Fig. 2). Chronostratigraphic unit II consists of the largest volume lava flow erupted at Lathrop Wells (Ql2a) on the east side of the center, several minor flow lobes on the northeast side of the center, and two sets of northwest trending scoria mounds. A wide-spread and voluminous scoria-fall and pyroclastic deposit (Qs2fs) is interbedded with the lava flows of chronostratigraphic unit II and is inferred to have erupted from a vent concealed beneath the main cinder cone of chronostratigraphic unit III. The eruptive events of chronostratigraphic unit III formed the main cinder cone (Qs3) on the west side of the center and a small-volume lava flow (Ql3) erupted from a vent on the northeast side of the center. Chronostratigraphic unit IV consists of three small-volume tephra units (Qs4a-c) erupted from a group of inferred vents south of the main cinder cone which have presumably been removed by commercial quarrying activity.

The strategy for geochemical sampling at Lathrop Wells was developed to answer the question of whether separate eruptive units defined by field geologic studies have distinct geochemical compositions. If geochemical variations exist, petrologic modeling can be used to infer the magmatic processes responsible for the variations, and thus provide insight into the physical processes responsible for the formation of basaltic volcanoes in the Yucca Mountain region. Because the range of geochemical variation at Lathrop Wells was assumed to be small, an initial concern was whether internal heterogeneity within individual eruptive units was greater than potential variations among eruptive units. For this reason, several (generally 3-6) samples were taken from each

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eruptive unit to establish the degree of internal geochemical variation, and to allow statistical comparison of eruptive units (Fig. 3).

Results

Geochemical data from the Lathrop Wells volcanic center was gathered as part of Study Plan 8.3.1.8.5.1, Characterization of Volcanic Features. These data include whole-rock major-element and trace-element data obtained by x-ray fluorescence (XRF), whole-rock trace-element data obtained by instrumental neutron activation analysis (INAA) and isotope dilution, whole-rock Nd, Sr and Pb isotopic analyses obtained by solid source mass spectrometry, and mineral chemistry obtained by electron microprobe. In this report, all analytical results presented in tables and graphs are grouped by chronostratigraphic unit or eruptive unit.

Major-element chemistry

One hundred nineteen whole-rock samples from Lathrop Wells were analyzed for major-element analyses at Los Alamos by XRF following the methods described in Los Alamos Detailed Procedure LANL-EES-DP-111, R3 (Table 1). The range of major-element variation among basalts from the Lathrop Wells center is not large. All are classified as alkali basalts in terms of total alkalis versus silica, using the classification of Cox et al, 1979 (Fig. 4).

A commonly used indicator of the degree of major-element evolution of a basalt due to fractional crystallization is *Mg number*, defined as $\left[\left(\frac{Mg}{Mg + Fe^{2+}}\right) \times 100\right]$, where Mg and Fe are the cation abundance. Unfractionated, primitive basalts in equilibrium with mantle olivine have Mg numbers in the range 68-72. Mg numbers of Lathrop Wells basalt cluster tightly around a value of about 54 (Fig. 5), indicating significant fractionation of either olivine or clinopyroxene prior to eruption (Crowe et al., 1994).

Normative compositions of Lathrop Wells basalt range from about 3 % normative nepheline to 15% normative hypersthene (Table 1). The variations in normative composition generally correlate with chronostratigraphic unit, with a trend of increasing silica saturation with decreasing age (Fig. 6). Basalts of chronostratigraphic unit I are primarily nepheline normative, basalts of chronostratigraphic unit II contain both normative nepheline and hypersthene, basalts of chronostratigraphic unit III are primarily hypersthene normative, and basalts of chronostratigraphic unit IV are exclusively hypersthene normative with normative hypersthene contents as high as 15%.

Trace-element chemistry

Whole rock trace-element analyses of V, Cr, Ni, Zn, Rb, Sr, Y, Zr, Nb and Ba were performed at Los Alamos by XRF using the procedures described in LANL-EES-DP-111, R3 (Table 1). Table 2 lists whole rock trace-element INAA analyses of Rb, Sc, Co, Sr, Ba, La, Ce, Nd, Sm, Eu, Tb, Yb, Lu, Hf, Ta and Th for 99 samples analyzed at Washington University, St. Louis, using procedures described in Korotev (1987). For each of three sample groups analyzed at Washington University, four blind replicate samples were analyzed to monitor analytical precision (Table 3). The replicate analyses indicate that all trace elements except Rb and Nd have analytical precision of <3%. Table 4 lists sixteen samples analyzed for Sm, Nd, Rb, Sr and Pb by isotope dilution at the University of Colorado using procedures described in Farmer et al. (1991). Analytical precision based on 6 replicate analyses is <1% for Sm, Nd, and Sr, and approximately 2% and 3% for Rb and Pb, respectively (Table 5).

Lathrop Wells basalts are notable in having high concentrations of trace elements such as the rare earth elements, Sr, Ba and Th compared to typical alkali basalts, combined with low concentrations of Rb (Vaniman et al., 1982). While part of the trace-element enrichment may be due to fractionation processes, an unusual trace-element enriched lithospheric mantle source is probably the primary cause (Vaniman et al., 1982; Farmer et al., 1989).

Isotope chemistry

Isotopic compositions of Nd, Sr and Pb for 16 Lathrop Wells basalts (Table 4) were analyzed at the University of Colorado using methods described in Farmer et al. (1991). Analytical precision based on 6 replicate analyses is 0.001% for $^{143}Nd/^{144}Nd$, 0.002% for $^{87}Sr/^{86}Sr$, 0.114% for $^{208}Pb/^{204}Pb$, 0.085% for $^{207}Pb/^{204}Pb$ and 0.058% for $^{206}Pb/^{204}Pb$ (Table 5).

The total range in Nd and Sr isotopic compositions at Lathrop Wells is fairly small with ε_{Nd} values ranging from -9.7 to -10.3 and $^{87}Sr/^{86}Sr$ ranging from about 0.7070 to 0.7071 (Fig. 7). As a group, samples of chronostratigraphic unit I have slightly higher $^{87}Sr/^{86}Sr$ (mean=0.707054, n=5) than samples of chronostratigraphic unit II (mean=0.0707016, n=7). This difference is statistically significant at the 95% confidence level using the two-tailed *t* test. The Sr and Nd isotopic compositions of Lathrop Wells basalts are highly unusual for continental alkali basalts of the western U.S. and indicate derivation from a trace-element enriched lithospheric mantle source (Farmer et al., 1989).

Petrography and Mineral Chemistry

Basalts of Lathrop Wells are sparsely porphyritic with phenocrysts of olivine and plagioclase in a fine-grained groundmass of plagioclase, olivine, titanomagnetite and clinopyroxene. The percentage of olivine phenocrysts is fairly constant at 1-4% for basalts of most eruptive units (Fig. 8). Plagioclase phenocrysts and microphenocrysts are

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most abundant in eruptive units of chronostratigraphic unit I. Plagioclase phenocrysts are largely absent in basalts of chronostratigraphic unit II, III and IV (Fig. 8).

Mineral chemistry was obtained by electron microprobe using methods described in Los Alamos Detailed Procedure LANL-EES-DP-131, R0. Mineral chemistry does not vary significantly by eruptive unit. The maximum forsterite content of analyzed olivine phenocrysts from all eruptive units is 78±1% (Figs. 9-16). In every case, olivine from lava flows is more zoned (Figs. 9-11, 13) than olivine from tephra units (Figs. 12, 14-16), probably because tephra was quickly quenched upon eruption, while lava flows cooled more slowly, allowing continued crystal growth after eruption. Olivine from tephra units show very limited zoning (<2% forsterite content) and also in some cases display slight reverse zoning (e.g., Fig. 14). Compositions of olivine are listed in Tables 6-13.

Plagioclase phenocrysts occur in units Ql1b, Ql1c, and Ql1d of chronostratigraphic unit I. The phenocrysts are moderately zoned labradorite with An contents ranging from about An 69 to An 60 (Figs. 17-18). Compositions of groundmass plagioclase in lavas of chronostratigraphic unit I (Ql1d and Ql1b) extend to significantly more sodic compositions (Figs. 19-20), while compositions of groundmass plagioclase in lavas of chronostratigraphic unit II and III (Ql2a and Ql3) include compositions as calcic as phenocrysts in lavas of chronostratigraphic unit I (Figs. 21-22). Compositions of plagioclase are listed in Tables 14-17.

Clinopyroxene occurs as a groundmass phase in all of the lava units at Lathrop Wells. We analyzed groundmass clinopyroxene from eruptive units Ql1d and Ql2a. Clinopyroxenes from unit Ql1d have higher MgO and less TiO_2 than clinopyroxene from Ql2a (Figs. 23-24, Tables 18-19).

Magnetite occurs as inclusions in olivine and in the groundmass of all eruptive units. Magnetites are titaniferous (7-22% TiO_2) and magnetite inclusions in olivine generally have higher Cr concentrations that magnetite from the groundmass (Tables 20-23).

Geochemistry of Eruptive Units

To illustrate the range of compositional variations within eruptive units and differences between eruptive units, we have created normalized line plots of compositions of individual samples grouped by eruptive unit (Figs. 25-36). All of the major and trace elements so plotted are incompatible during fractionation of olivine, the major phenocryst phase in these rocks. Sample compositions were normalized to the average Lathrop Wells composition using a combination of XRF and INAA data (n=99). This approach emphasizes similarities and differences between samples at Lathrop Wells and allows direct inspection of percent differences between samples. In general, individual eruptive units are geochemically homogeneous and show a limited range of geochemical variation (e.g., Figs. 25-28, 32-33, 35-36). The voluminous lava flow and tephra fall deposit of chronostratigraphic unit II appear to have the most internal heterogeneity (Figs. 30-31).

Averaged compositions of the major eruptive units grouped by chronostratigraphic unit are illustrated in Figs. 37-40. In general, individual eruptive units within each of the four chronostratigraphic units share similar geochemical characteristics. All of the eruptive units within chronostratigraphic unit I show similar geochemical patterns that include relatively low concentrations of Th and La, and relatively high concentrations of K, Sr, P, Sm, Eu and Ti compared to the Lathrop Wells compositional mean (Fig. 37). Eruptive units within chronostratigraphic unit II are characterized by a lack of significant variation from the mean Lathrop Wells composition (Fig. 38). The two eruptive units of chronostratigraphic unit III are geochemically similar and are marked by high concentrations of Th and low concentrations of Sr, P, Sm, Eu and Ti (Fig. 39). The three eruptive units of chronostratigraphic unit IV are geochemically diverse. Eruptive unit Qs4b is distinguished from all other eruptive units at Lathrop Wells by having the highest concentrations of Th and Rb (Rb not plotted, see Tables 1 and 2), and the lowest concentrations of Sr and Ti (Fig. 40). Eruptive unit Qs4c is characterized by generally low concentrations of all incompatible elements (Fig. 40). The geochemical differences between eruptive units should permit correlation of ashes in trenched fault exposures near Yucca Mountain to individual eruptive units at Lathrop Wells.

Isotope dilution is a high-precision method of determining trace-element concentrations (Table 5) and offers an independent method of assessing geochemical differences between eruptive units. The isotope dilution data are compatible with the INAA data discussed above and show that most eruptive units are geochemically distinct, with eruptive units of chronostratigraphic unit I having the highest concentrations of Sr and the middle rare-earth elements (Nd and Sm), and unit Ql4c having the lowest concentrations of Sr, Nd and Sm (Figs. 41-42).

At what level are differences in the mean compositions of different eruptive units statistically significant? As an example, we consider eruptive units Ql1a and Ql1d, adjacent lava flows which show moderate (1-8%) differences in average elemental concentrations (Fig. 43). To test for the statistical significance of these differences, we use the two-tailed *t* test, which calculates the probability that two sample means are equal. Probabilities of < 0.05 indicate that two sample means represent different populations at the 95% confidence level. In the case of Ql1d and Ql1a, the average concentrations of Ba, Th, K, Ce, Sr and Eu can be distinguished at the 95% confidence level (Fig 43). From these results, we conclude that differences in average elemental concentrations as small as 1-2% are statistically significant for elements with the highest analytical precision (e.g., Ce, Table 3) and are almost always significant for average differences of >3-4%. Differences in average elemental concentrations between eruptive units of different chronostratigraphic units are commonly 5-10% and are >35% in the case of Th (Figs. 37-40).

The capability of geochemically discriminating eruptive units at Lathrop Wells provides a useful tool for constraining the eruptive history of the center and to tie the eruptive history to tectonic studies of the Yucca Mountain region. For example, the most

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voluminous tephra and pyroclastic surge deposit at Lathrop Wells (Qs2fs) was assumed, by analogy to other basalt centers, to be part of the eruptions which formed the main cinder cone of chronostratigraphic unit III (Figure 2). Because of its volume and widespread distribution, ash of unit Qs2fs is most likely the dominant ash found in fault exposures near Yucca Mountain. Geochemical differences between eruptive units Qs2fs and Qs3 indicate that the two eruptive units are not the same (Fig. 44). This observation, combined with stratigraphic and geomorphic evidence, led to the assignment of unit Qs2fs to chronostratigraphic unit II (Crowe et al., 1994). This interpretation places the inferred correspondence of volcanic and tectonic activity recorded by ashes in fault fissures farther in the geologic past. The ability to discriminate eruptive units at Lathrop Wells will provide the primary basis for correlating basaltic ashes in trenched fault exposures near Yucca Mountain to dated eruptive units at Lathrop Wells.

The earliest evidence that the Lathrop Wells volcanic center is polycyclic was the recognition of a soil horizon between tephra unit Qs4b and underlying tephra of Qs3, the deposits of the main scoria cone (Wells et al., 1988). The soil was interpreted to represent a hiatus between eruptions at Lathrop Wells of at least several thousand years. An alternative interpretation was that tephra Qs4b is reworked tephra from the slope of the main cinder cone, an interpretation which does not require a polycyclic history of the center (Turrin et al., 1992). Geochemical differences between Qs3 and Ql4b confirm that Ql4b cannot be reworked tephra from Qs3 (Fig. 45). Its unique geochemical composition compared to all other Lathrop Wells eruptive units, combined with a thermoluminescence date of ~ 4 ka on the underlying soil, indicate that it represents a distinct eruptive episode and supports the conclusion that the Lathrop Wells center is polycyclic with eruptions that extended into the Holocene (Crowe et al., 1994).

A final example of how geochemical correlation can provide evidence of polycyclic activity is the relationship between vent conduits and overlying tephra in the southeast quarry area. The tephra overlying these conduits was assumed to be related to the conduits on the basis of field mapping. Geochemical data show that the vent conduits are geochemically similar to lavas of chronostratigraphic unit I and are in the appropriate location for vents of the southern flows of chronostratigraphic unit I (Fig. 2). The overlying tephra unit, however, is geochemically distinct from the vent conduits and most similar to tephra of Qs2fs (Fig. 46). The vent conduits were significantly stripped and eroded before emplacement of the overlying, geochemically distinct tephra, signifying a significant period of geologic time between the emplacement of the conduits and the overlying tephra.

In detail, geochemical differences between eruptive units at Lathrop Wells cannot be accounted for by simple fractional crystallization of a single magma batch (Crowe et al., 1994). For instance, variations of Th/K at the same Mg number for the major eruptive units of chronostratigraphic unit I, II, and III indicate at least 4 separate magma batches. (Fig. 47). Preliminary modeling of more complex magmatic processes including magma recharge also indicate the existence of distinct magma batches.

Implications for Volcanic Risk Assessment

Field, geomorphic and geochemical evidence indicate a complex and extended eruptive history at Lathrop Wells involving multiple magma batches and several eruptive episodes that were separated by significant periods of inactivity. The eruption of several independent magma batches at a single location in the Yucca Mountain region suggests that eruptions in the region will not occur at random locations in the near future (10^4-10^5 years), but probably near the site of previous eruptions at Lathrop Wells. If this conclusion of preferred eruption sites is correct, the calculated probability of magma ascending at the potential Yucca Mountain repository during the next 10,000 years is lower than that calculated for models which assume random sites of future eruptions.

Acknowledgments

Sample and data collection information and documentation for this report are contained in Field Notebooks TWS-EES-13-LV-12-89-03 and EES-13-LV-02-93-07, Sample Logbooks TWS-EES-13-LV-12/89-04, TWS-EES-13-LV-04-91-01 and LA-EES-13-05-94-006, and Scientific Notebooks TWS-EES-13-LV-12-89-05 and TWS-EES-13-07-93-044. The Los Alamos Data Tracking Number for this report is LA000000000099.001. This work was supported by the Yucca Mountain Site Characterization Project Office as part of the Civilian Radioactive Waste Management Program. This program is managed by the U.S. Department of Energy, Yucca Mountain Site Characterization Office.

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Figure Captions

Figure 1. Location of Lathrop Wells in relation to the potential Yucca Mountain repository. From oldest to youngest, basaltic volcanic centers are Thirsty Mesa (TM), Buckboard Mesa (BB), Amargosa Valley (AV), Crater Flat (CF), Sleeping Butte (SB) and Lathrop Wells (LW).

Figure 2. Geologic map of the Lathrop Wells volcanic center.

Figure 3. Geochemistry sample locations at the Lathrop Wells volcanic center.

Figure 4. Alkalis versus silica for basalts of Lathrop Wells. All of the basalts of Lathrop Wells are classified as alkaline basalt according to the classification scheme of Cox et al. (1979).

Figure 5. Histogram of Mg numbers for basalts of Lathrop Wells.

Figure 6. Normative compositions of Lathrop Wells basalts grouped by chronostratigraphic unit (Fig. 2) plotted within ternary fields bounded by Ne-Ol-Di-Hy.

Figure 7. ε_{Nd} versus $^{87}Sr/^{86}Sr$ for eruptive units of the Lathrop Wells volcanic center.

Figure 8. Percent olivine and plagioclase phenocrysts and microphenocrysts determined by point counting for representative samples of eruptive units from the Lathrop Wells volcanic center. Samples counted from each eruptive unit are LW20FVP from Ql1d, LW73FVP from Ql1b, LW11FVP from Ql1a, LW40FVP from Ql2a, LW97FVP from Qs2fs, LW61FVP from Ql3, LW80FVP from Qs3, LW78FVP from Qs4b and LW151 from Qs4a.

Figure 9. Forsterite content of olivine phenocrysts from LW21FVP of Ql1d determined by rim to rim microprobe traverses.

Figure 10. Forsterite content of olivine phenocrysts from LW73FVP of Ql1b determined by rim to rim microprobe traverses.

Figure 11. Forsterite content of olivine phenocrysts from LW40FVP of Ql2a determined by rim to rim microprobe traverses.

Figure 12. Forsterite content of olivine phenocrysts from LW135FVP of Qs2fs determined by rim to rim microprobe traverses.

Figure 13. Forsterite content of olivine phenocrysts from LW61FVP of Ql3 determined by rim to rim microprobe traverses.

Figure 14. Forsterite content of olivine phenocrysts from LW80FVP of Qs3 determined by rim to rim microprobe traverses.

Figure 15. Forsterite content of olivine phenocrysts from LW78FVP of Qs4b determined by rim to rim microprobe traverses.

Figure 16. Forsterite content of olivine phenocrysts from LW151FVP of Qs4a determined by rim to rim microprobe traverses.

Figure 17. Anorthite content of plagioclase phenocrysts from LW21FVP of Ql1d determined by rim to rim microprobe traverses.

Figure 18. Anorthite content of plagioclase phenocrysts from LW73FVP of Ql1b determined by rim to rim microprobe traverses.

Figure 19. Feldspar compositions from LW21FVP of Ql1d plotted within the ternary field Or-Ab-An. Open squares are compositions of phenocryst interiors, open circles are compositions of phenocryst rims and groundmass crystals.

Figure 20. Feldspar compositions from LW73FVP of Ql1b plotted within the ternary field Or-Ab-An. Open squares are compositions of phenocryst interiors, open circles are compositions of phenocryst rims and groundmass crystals.

Figure 21. Feldspar compositions from LW40FVP of Ql2a plotted within the ternary field Or-Ab-An. Open circles are compositions of groundmass crystals.

Figure 22. Feldspar compositions from LW61FVP of Ql3 plotted within the ternary field Or-Ab-An. Open circles are compositions of groundmass crystals.

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Figure 23. Pyroxene compositions from LW21FVP of Ql1d plotted within the ternary field Wo-En-Fs. Filled circles are compositions of groundmass crystals.

Figure 24. Pyroxene compositions from LW40FVP of Ql2a plotted within the ternary field Wo-En-Fs. Filled circles are compositions of groundmass crystals.

Figure 25. Line plot of incompatible element concentrations for samples of eruptive unit Ql1a normalized to the average concentration of each element for all analyzed Lathrop Wells samples (n=99). Normalizing values are Ba=1361.96 parts per million (ppm), Th=6.867 ppm, K=15,249.49 ppm, T 378 ppm, La=93.353 ppm, Ce=181.668 ppm, Sr=1469.56 ppm, P=52[illegible] ppm, Sm=12.239 ppm, Eu=3.149 ppm, Zr=370.652 ppm, Hf=7.219 ppm, Ti=11,522.39 ppm, Tb=1.135 ppm, Yb=2.369 ppm, Lu=.344 ppm. Ba, K, Sr, P, Zr and Ti were determined by XRF; all other elements determined by INAA.

Figure 26. Line plot of incompatible element concentrations for samples of eruptive unit Ql1b normalized to the average concentration of each element for all analyzed Lathrop Wells samples (n=99).

Figure 27. Line plot of incompatible element concentrations for samples of eruptive unit Ql1c normalized to the average concentration of each element for all analyzed Lathrop Wells samples (n=99).

Figure 28. Line plot of incompatible element concentrations for samples of eruptive unit Ql1d normalized to the average concentration of each element for all analyzed Lathrop Wells samples (n=99).

Figure 29. Line plot of incompatible element concentrations for samples of eruptive unit Qs1u normalized to the average concentration of each element for all analyzed Lathrop Wells samples (n=99). Qs1u represents all analyzed vents of chronostratigraphic unit I.

Figure 30. Line plot of incompatible element concentrations for samples of eruptive unit Ql2a normalized to the average concentration of each element for all analyzed Lathrop Wells samples (n=99).

Figure 31. Line plot of incompatible element concentrations for samples of eruptive unit Qs2fs normalized to the average concentration of each element for all analyzed Lathrop Wells samples (n=99).

Figure 32. Line plot of incompatible element concentrations for samples of eruptive unit Ql3 normalized to the average concentration of each element for all analyzed Lathrop Wells samples (n=99).

Figure 33. Line plot of incompatible element concentrations for samples of eruptive unit Qs3 normalized to the average concentration of each element for all analyzed Lathrop Wells samples (n=99).

Figure 34. Line plot of incompatible element concentrations for samples of eruptive unit Qs4a normalized to the average concentration of each element for all analyzed Lathrop Wells samples (n=99).

Figure 35. Line plot of incompatible element concentrations for samples of eruptive unit Qs4b normalized to the average concentration of each element for all analyzed Lathrop Wells samples (n=99).

Figure 36. Line plot of incompatible element concentrations for samples of eruptive unit Qs4c normalized to the average concentration of each element for all analyzed Lathrop Wells samples (n=99).

Figure 37. Line plot of average compositions of eruptive units from chronostratigraphic unit I.

Figure 38. Line plot of average compositions of eruptive units from chronostratigraphic unit II.

Figure 39. Line plot of average compositions of eruptive units from chronostratigraphic unit III.

Figure 40. Line plot of average compositions of eruptive units from chronostratigraphic unit IV.

Figure 41. Rb versus Nd (ppm) for eruptive units of the Lathrop Wells volcanic center.

Figure 42. Sr versus Sm (ppm) for eruptive units of the Lathrop Wells volcanic center.

Figure 43. Line plot comparing average compositions of eruptive units Ql1a and Ql1d. Values below each element are the probability that the sample means of each element represent the same populations using the two-tailed *t* test. Values in bold indicate elements with statistically significant (95% confidence level) differences in average composition (also indicated by data points enclosed in rectangles).

Figure 44. Line plot comparing average compositions of eruptive units Qs3 and Qs2fs. Average concentrations of Th and Ti for the two units are statistically different at the 95% confidence level using the two-tailed *t* test.

Figure 45. Line plot comparing average compositions of eruptive units Qs3 and Qs4b.

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Figure 46. Line plot comparing samples from Qs1 vent conduits (dashed lines) and samples of oxidized scoria that are probably part of scoria fall sheet Qs2fs (solid lines).

Figure 47. Mg number versus Th/K for selected eruptive units of the Lathrop Wells volcanic center. Arrow represents the qualitative change in Mg number and Th/K for a magma undergoing fractional crystallization of olivine, clinopyroxene, or plagioclase. Different Th/K values of eruptive units indicate that the units are not derived from a single magma undergoing fractional crystallization.

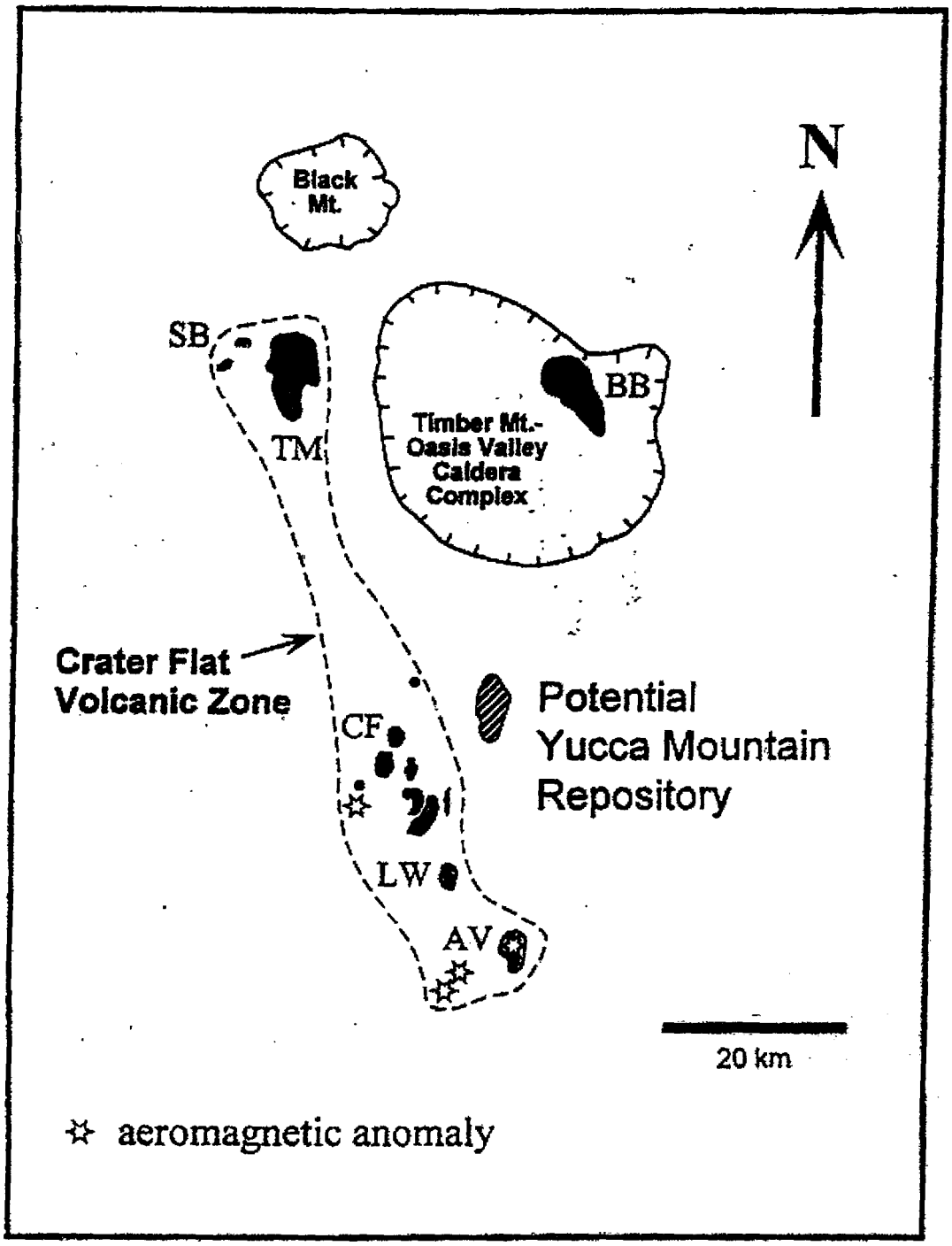

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Figure 1

Lathrop Wells Volcanic Center

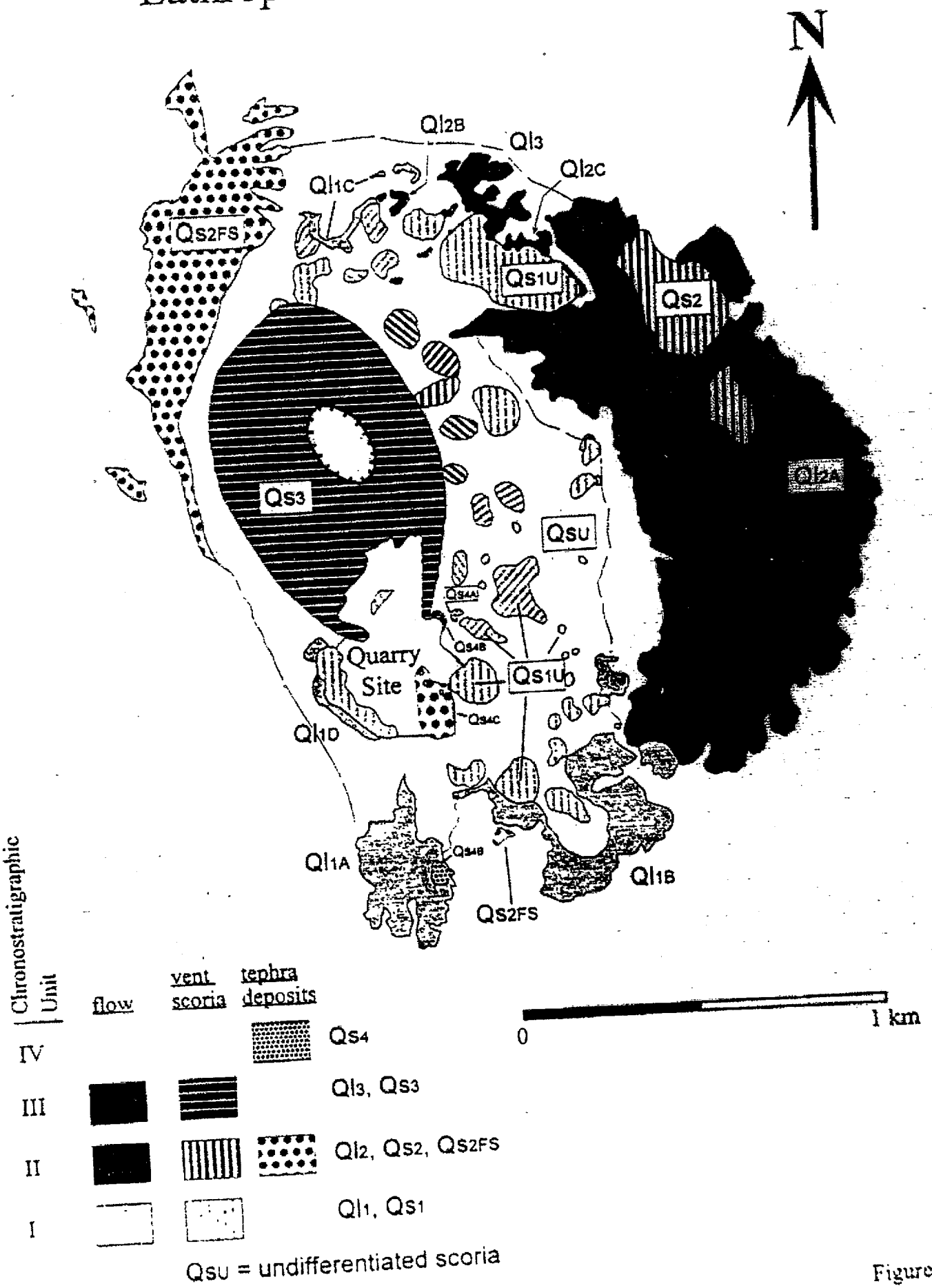

Figure 2

Geochemistry sample locations, Lathrop Wells volcanic center

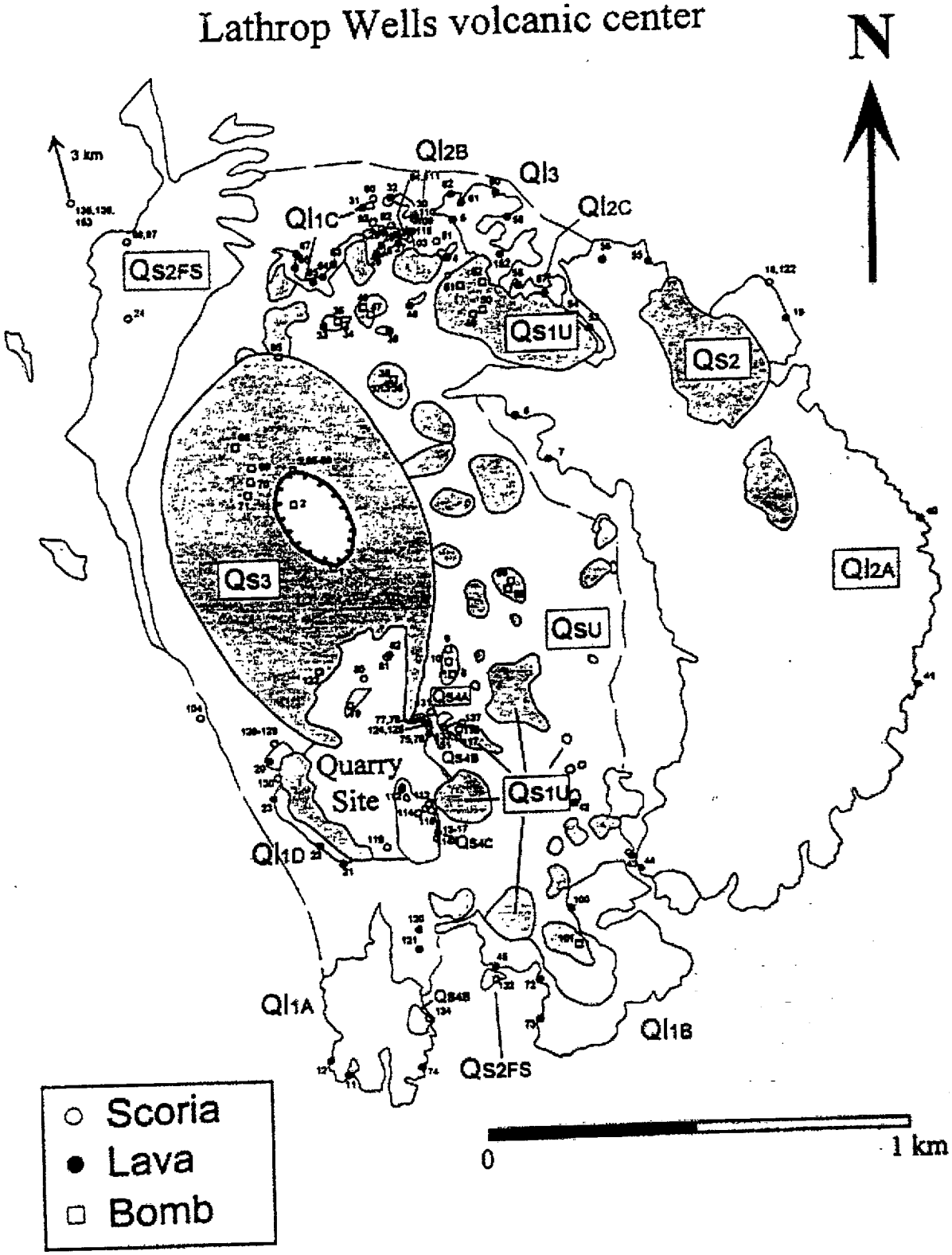

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Figure 3

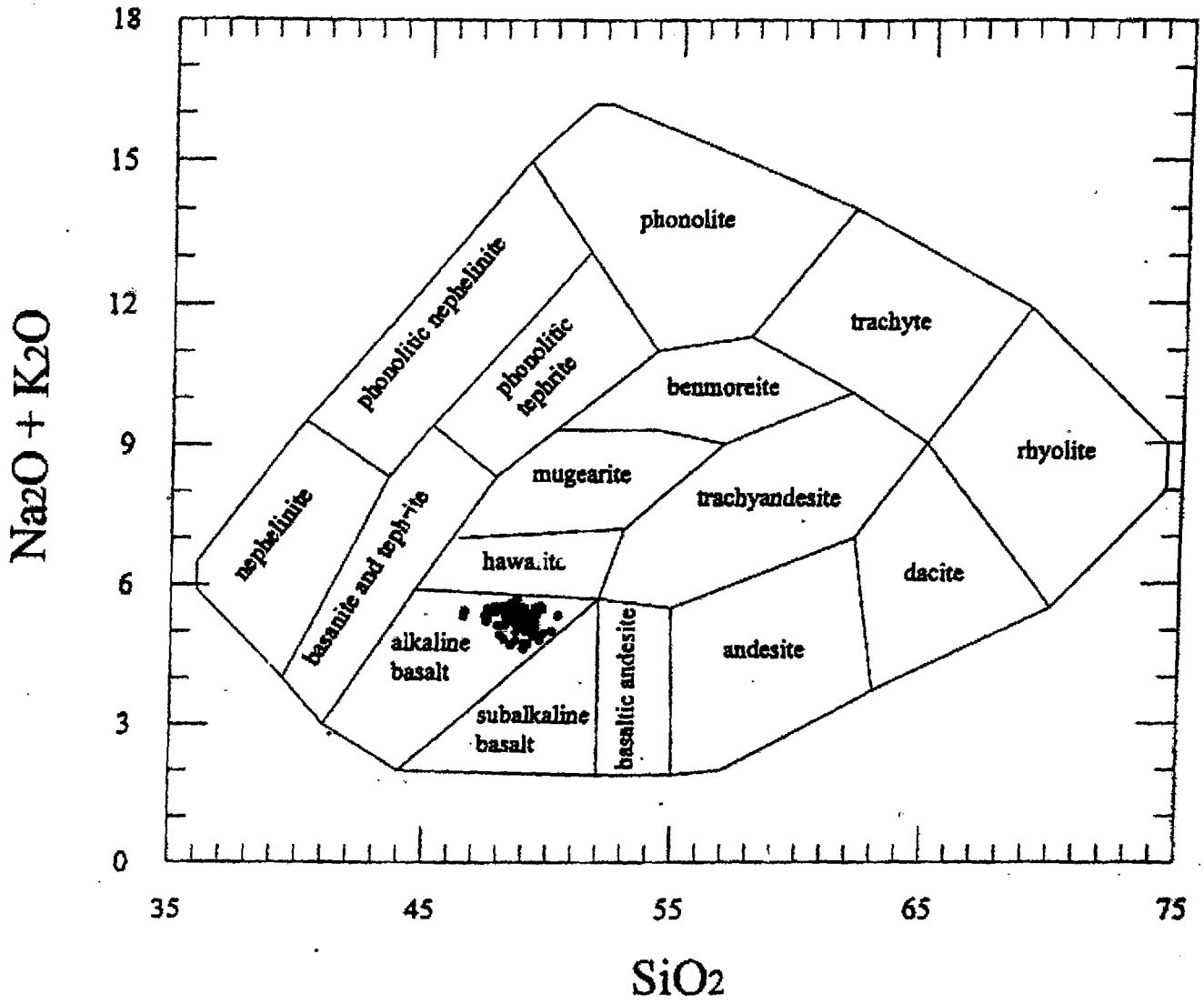
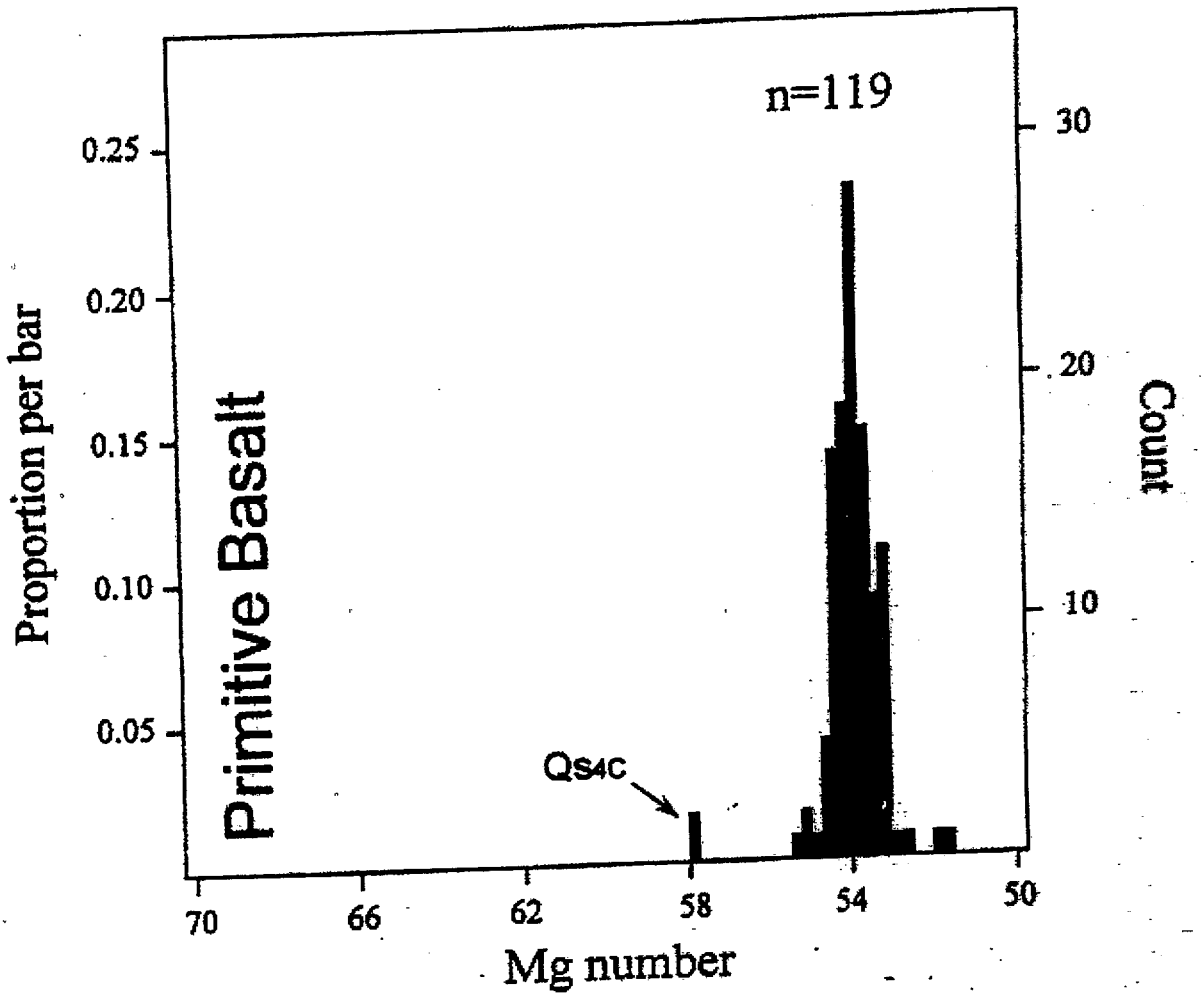
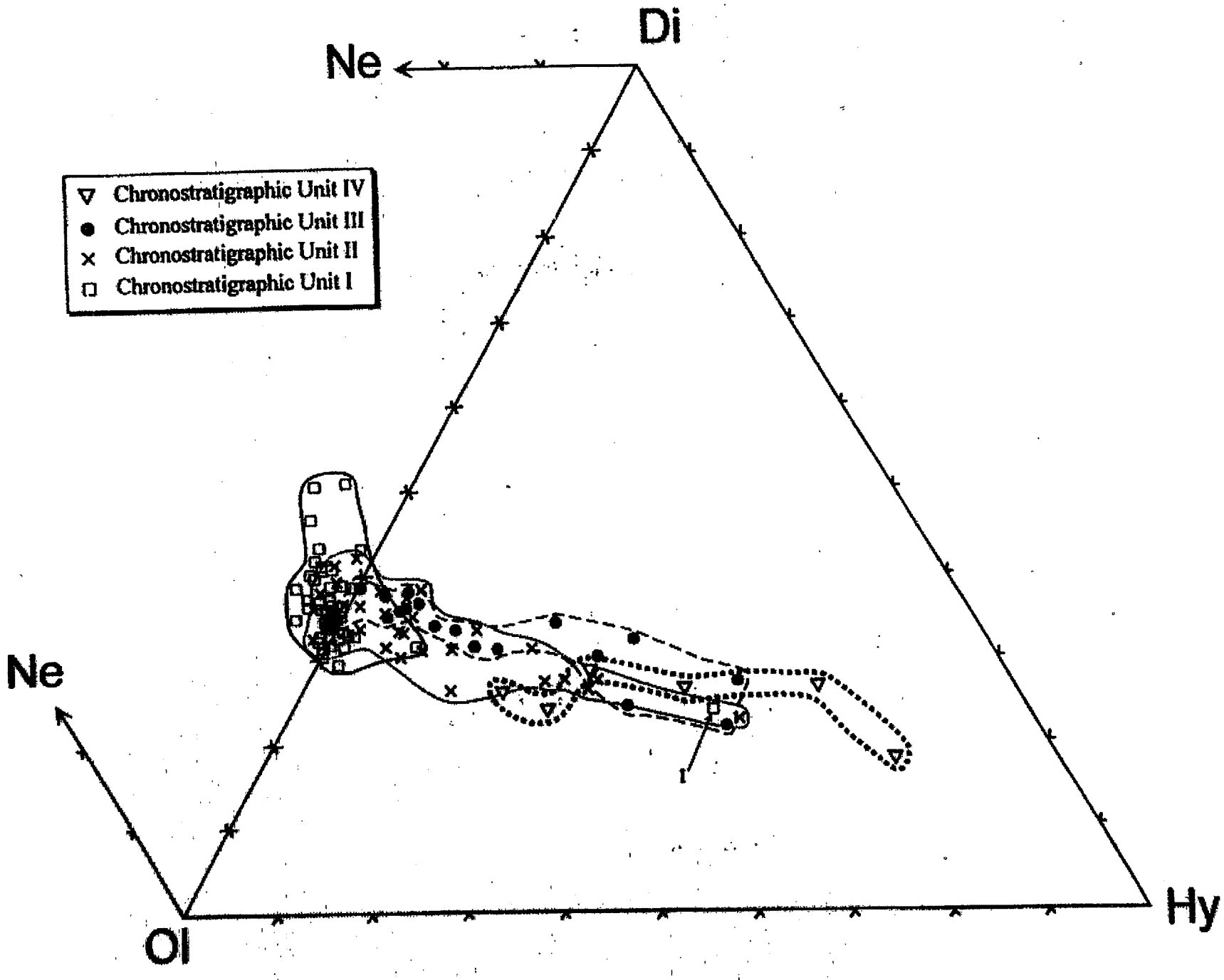

18
15
12
9
6
3
0
35
45
55
65
75
Na2O + K2O
SiO2
phonolite
trachyte
rhyolite
phonolitic nephelinite
phonolitic tephrite
benmoreite
mugearite
trachyandesite
nephelinite
basanite and tephrite
hawaiite
dacite
alkaline basalt
basaltic andesite
andesite
subalkaline basalt

Figure 4



EXAMPLE

Figure 5


Di
Ne
Ne
Ol
Hy
Chronostratigraphic Unit IV
Chronostratigraphic Unit III
Chronostratigraphic Unit II
Chronostratigraphic Unit I
1

Figure

EXAMPLE

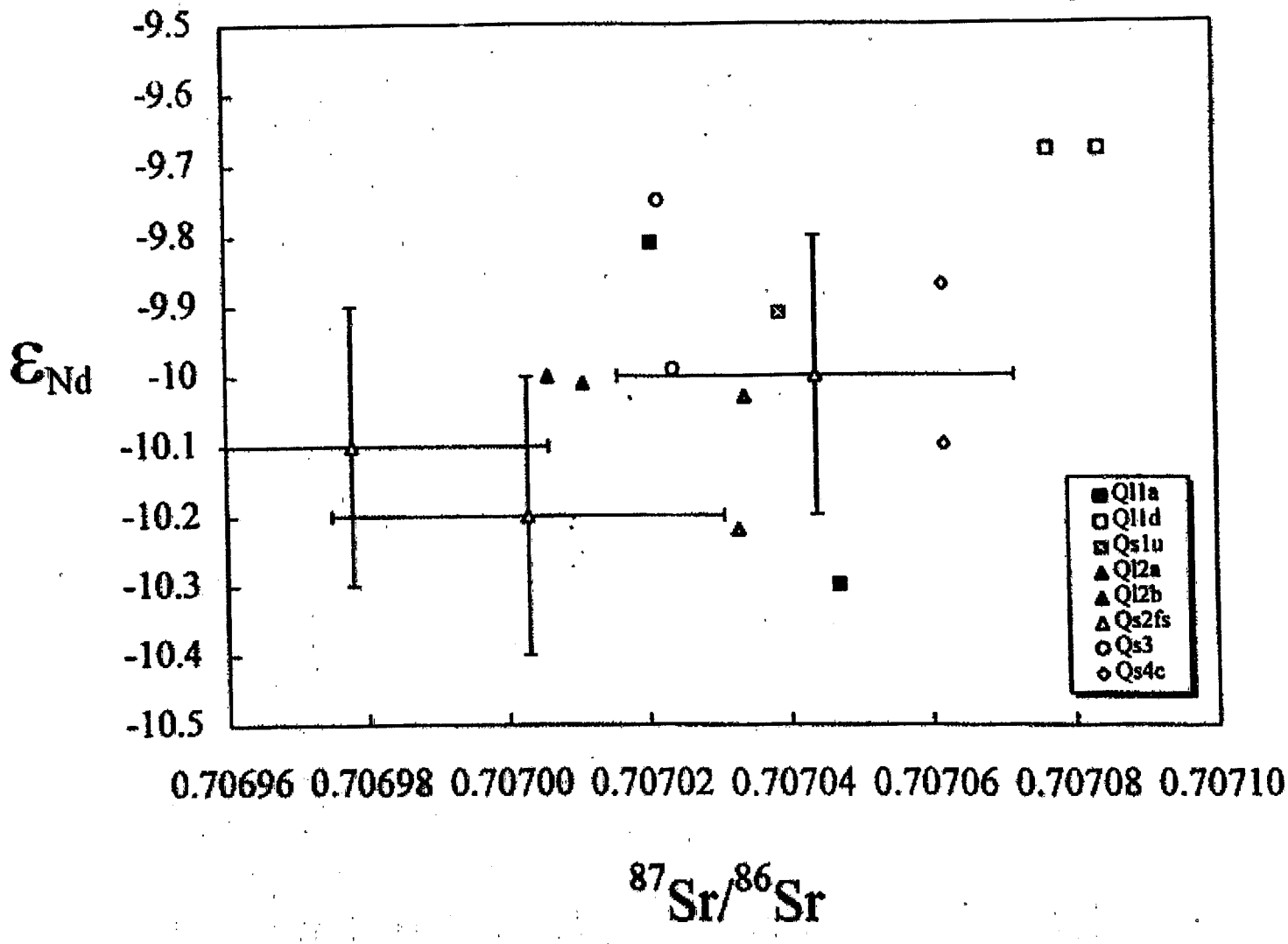
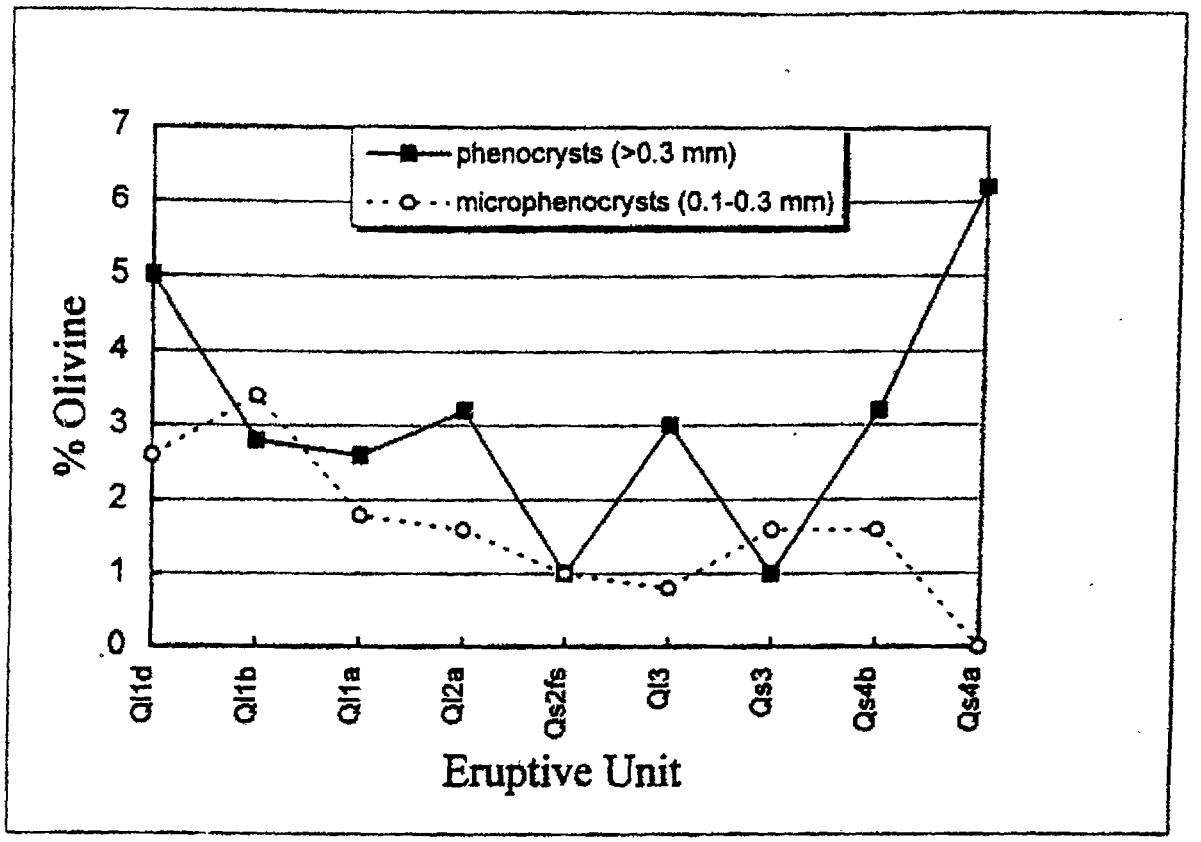


Figure 7


phenocrysts (>0.3 mm)
microphenocrysts (0.1-0.3 mm)
% Olivine
0
1
2
3
4
5
6
7
Ql1d
Ql1b
Ql1a
Ql2a
Qs2fs
Ql3
Qs3
Qs4b
Qs4a
Eruptive Unit

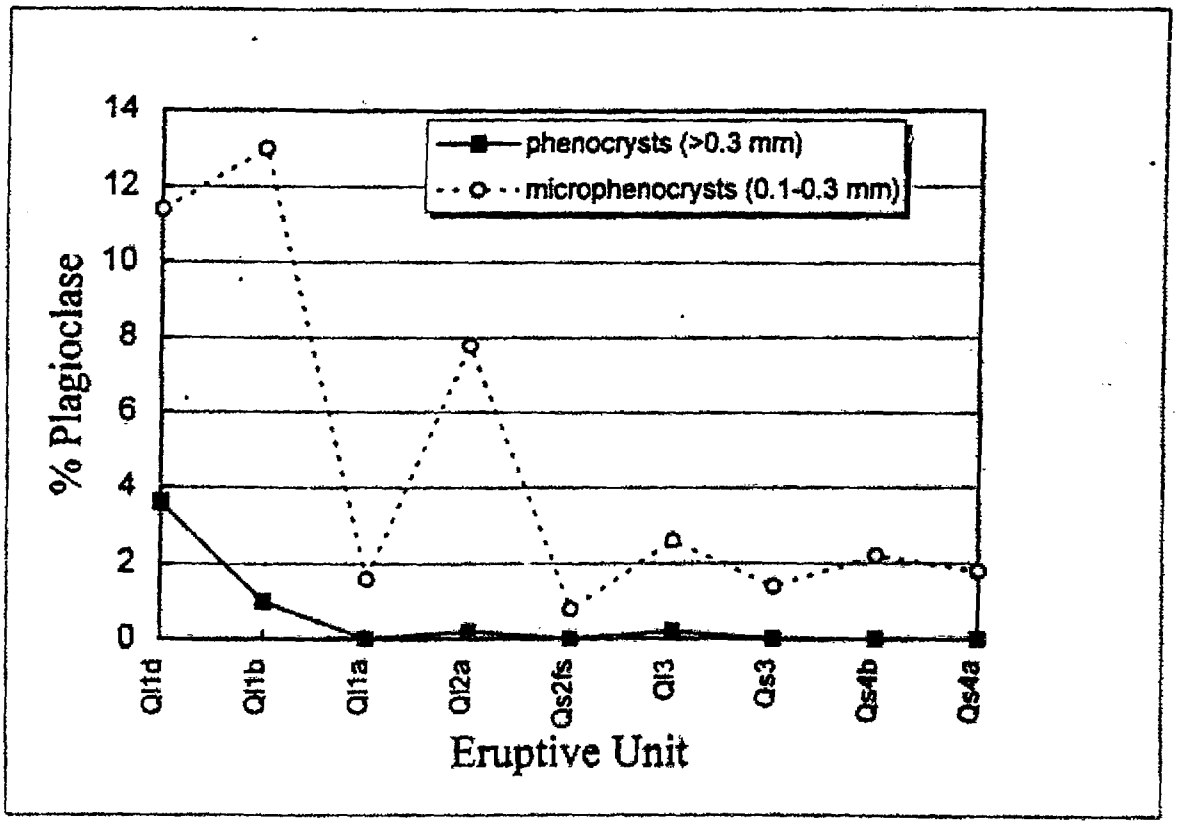
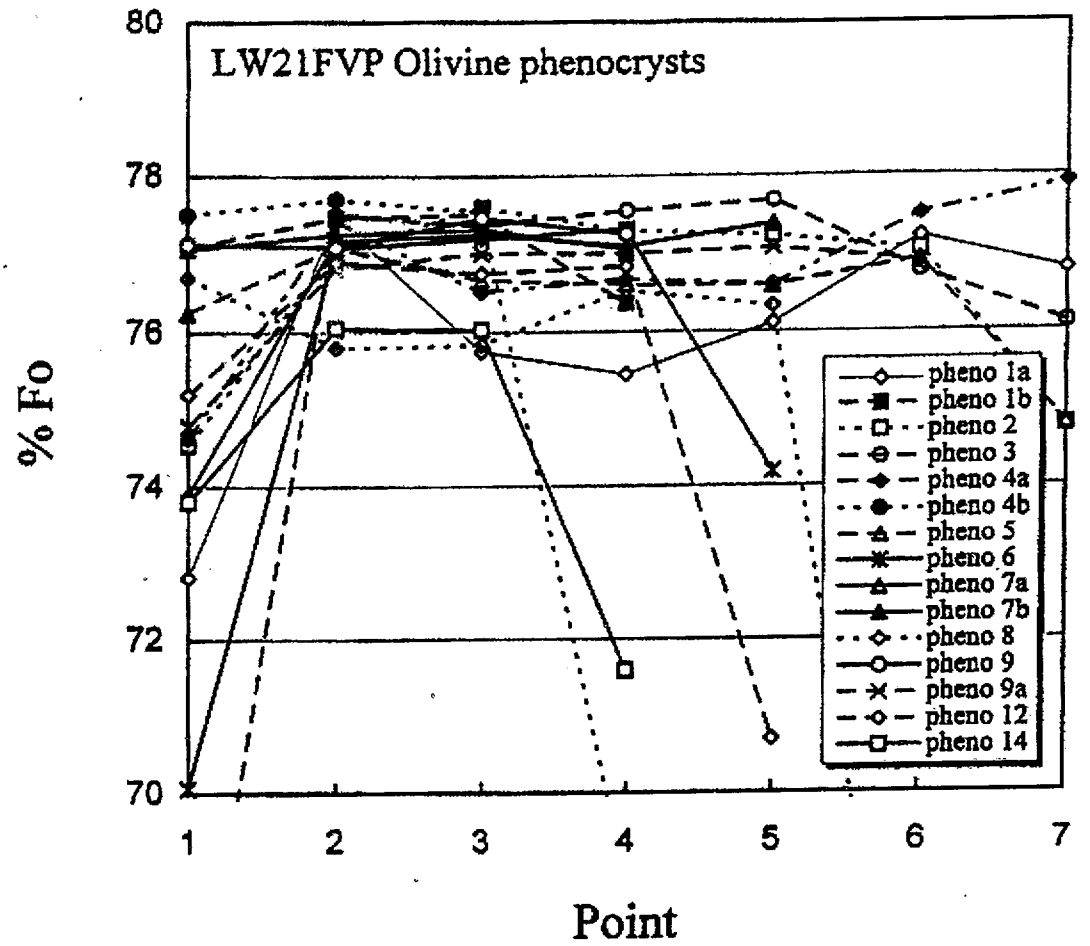

phenocrysts (>0.3 mm)
microphenocrysts (0.1-0.3 mm)
% Plagioclase
0
2
4
6
8
10
12
14
Ql1d
Ql1b
Ql1a
Ql2a
Qs2fs
Ql3
Qs3
Qs4b
Qs4a
Eruptive Unit

Figure 8



EXAMPLE

Figure 9

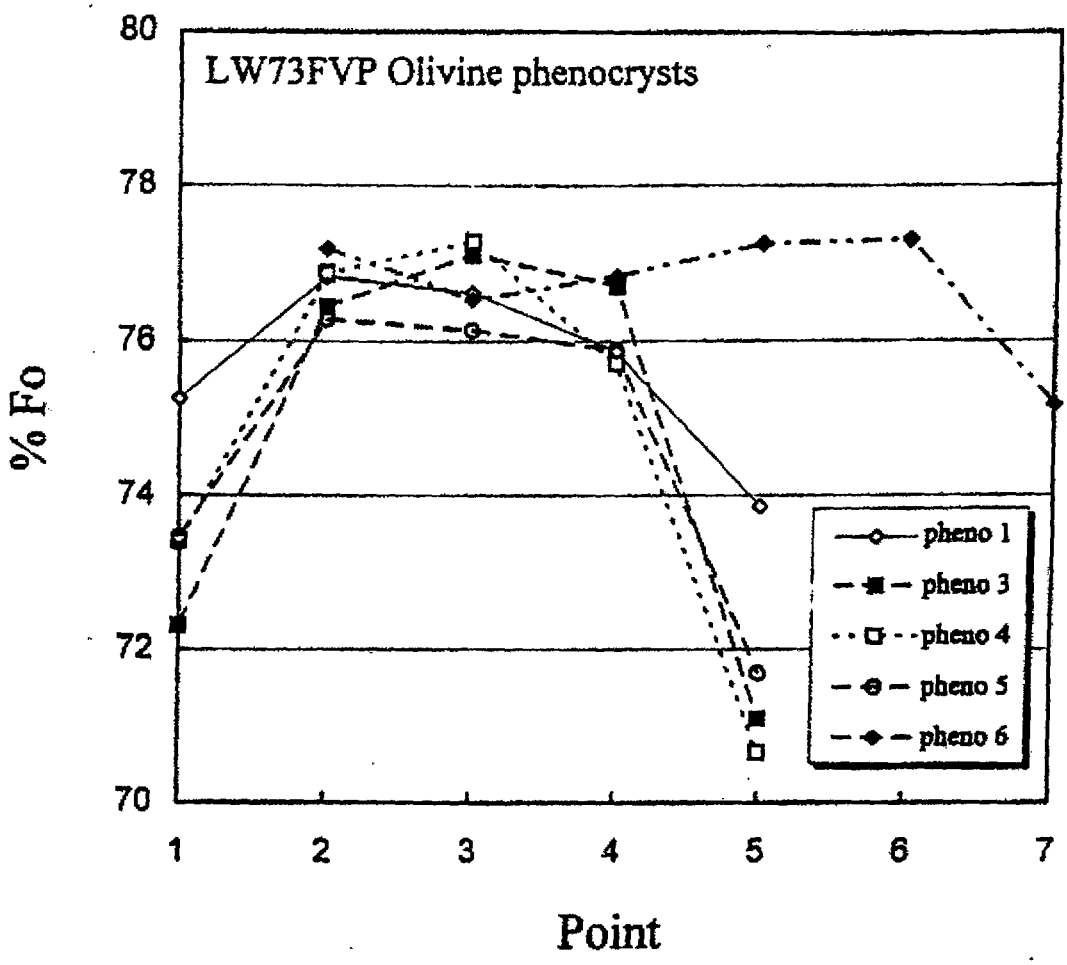
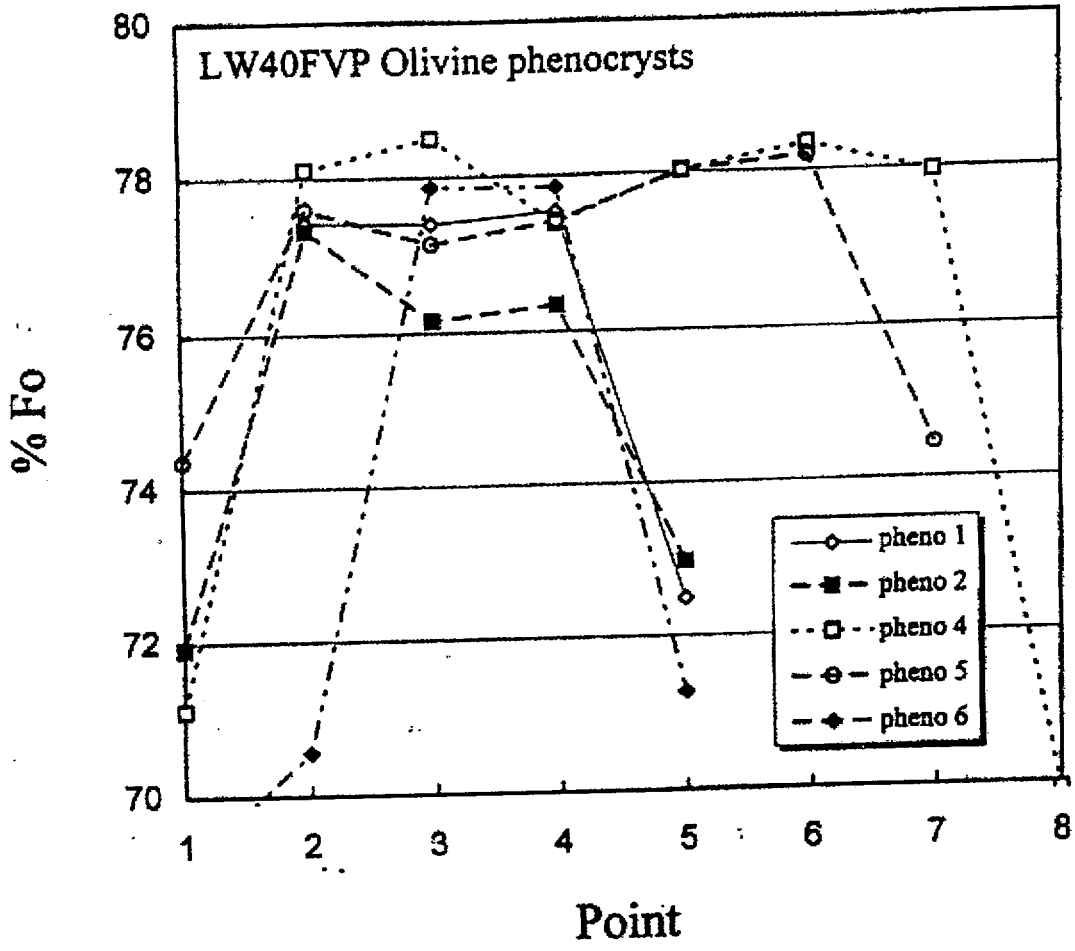

LW73FVP Olivine phenocrysts
80
78
76
74
72
70
% Fo
1
2
3
4
5
6
7
Point
pheno 1
pheno 3
pheno 4
pheno 5
pheno 6

Figure 10


LW40FVP Olivine phenocrysts
% Fo
80
78
76
74
72
70
1
2
3
4
5
6
7
8
Point
pheno 1
pheno 2
pheno 4
pheno 5
pheno 6

EXAMPLE

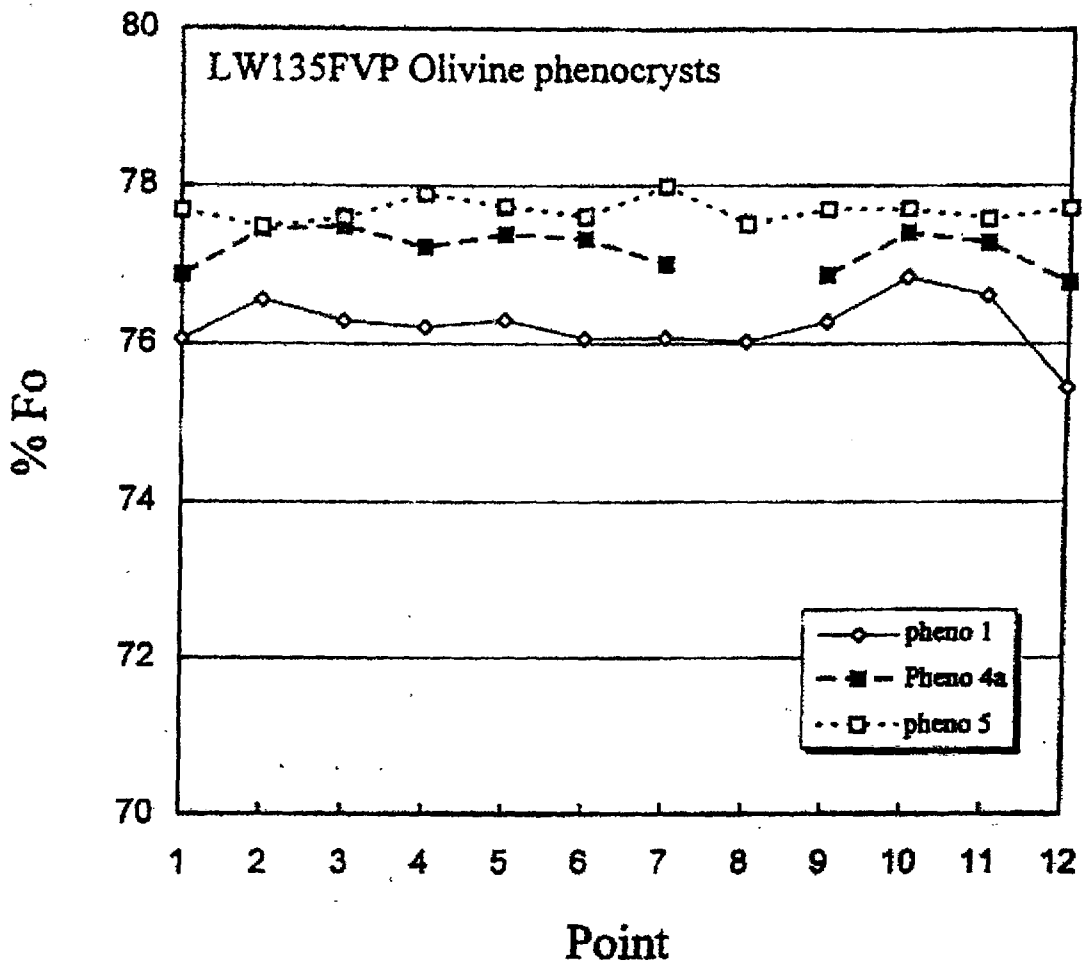
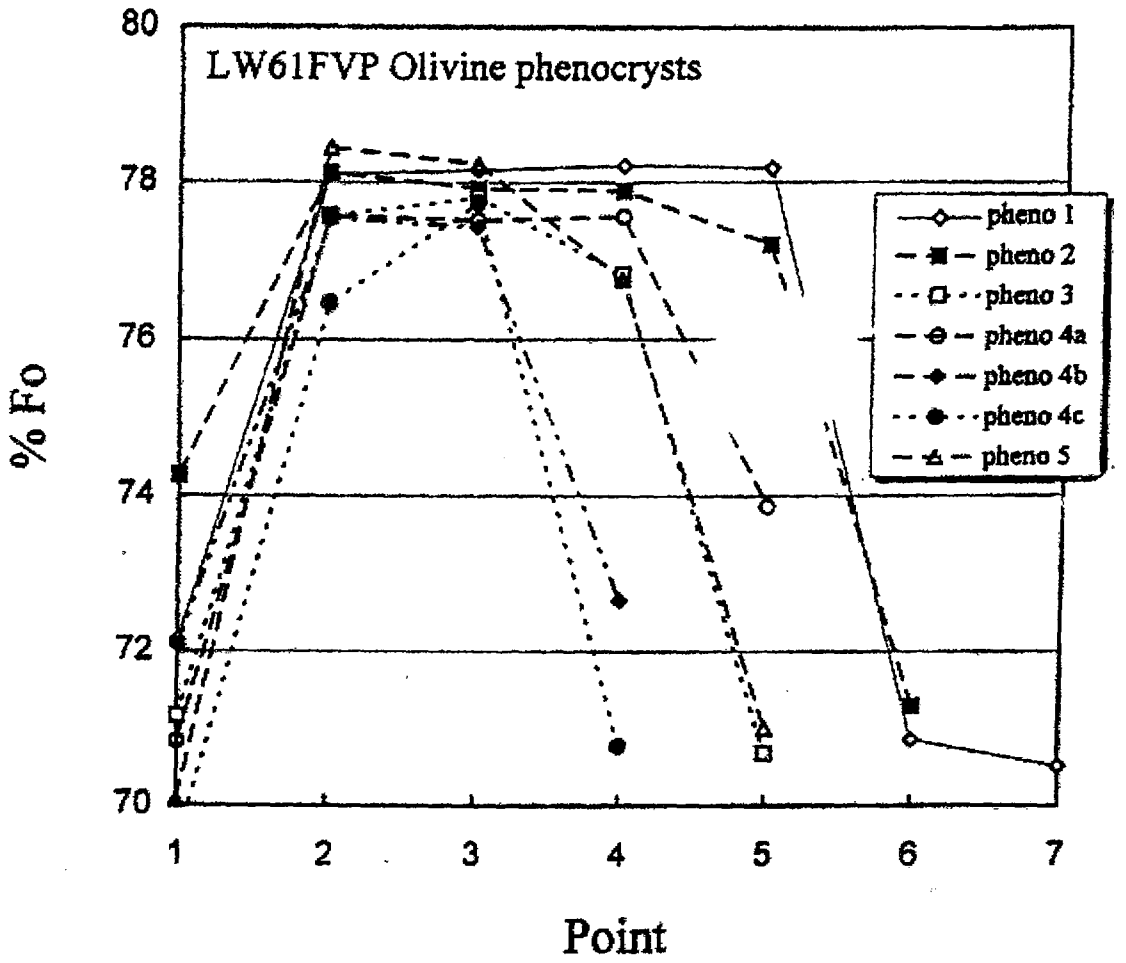

LW135FVP Olivine phenocrysts
80
78
76
74
72
70
% Fo
1
2
3
4
5
6
7
8
9
10
11
12
Point
pheno 1
Pheno 4a
pheno 5

Figure 12


LW61FVP Olivine phenocrysts
% Fo
Point
80
78
76
74
72
70
1
2
3
4
5
6
7
pheno 1
pheno 2
pheno 3
pheno 4a
pheno 4b
pheno 4c
pheno 5

EXAMPLE

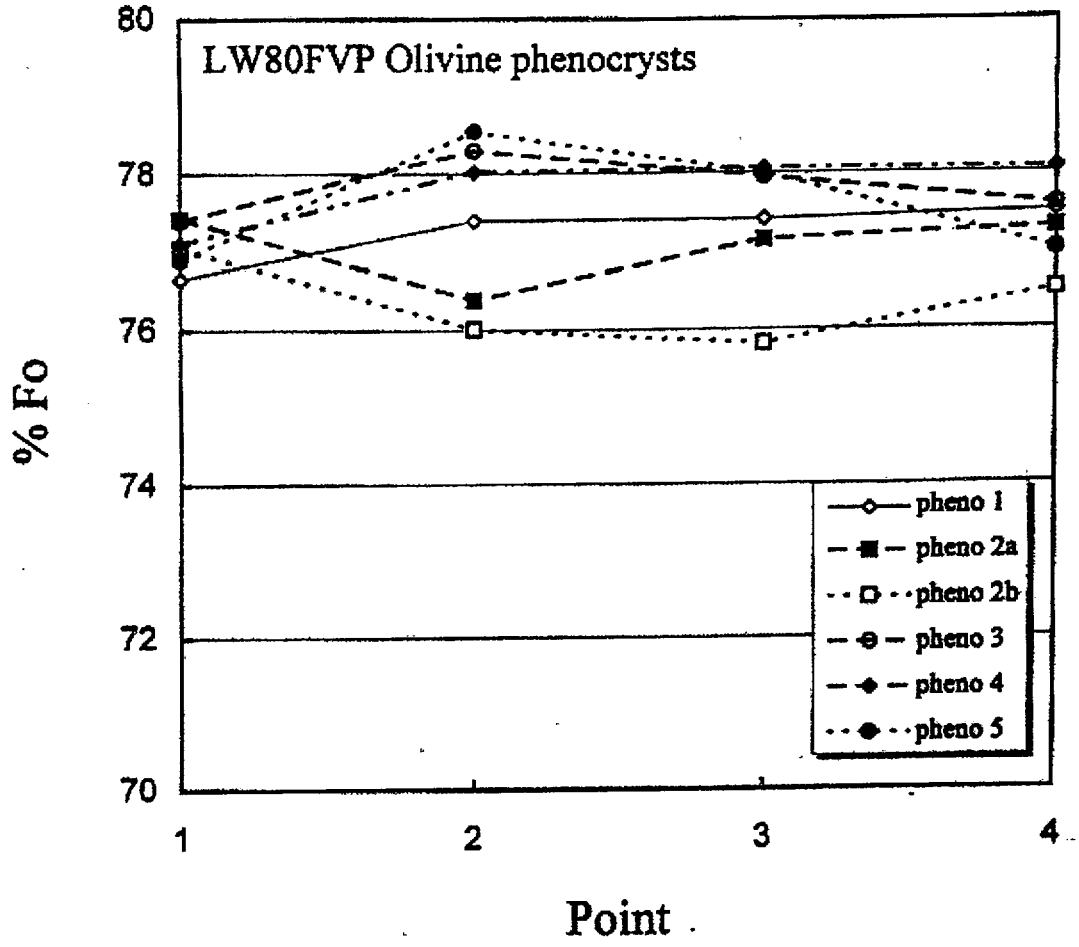
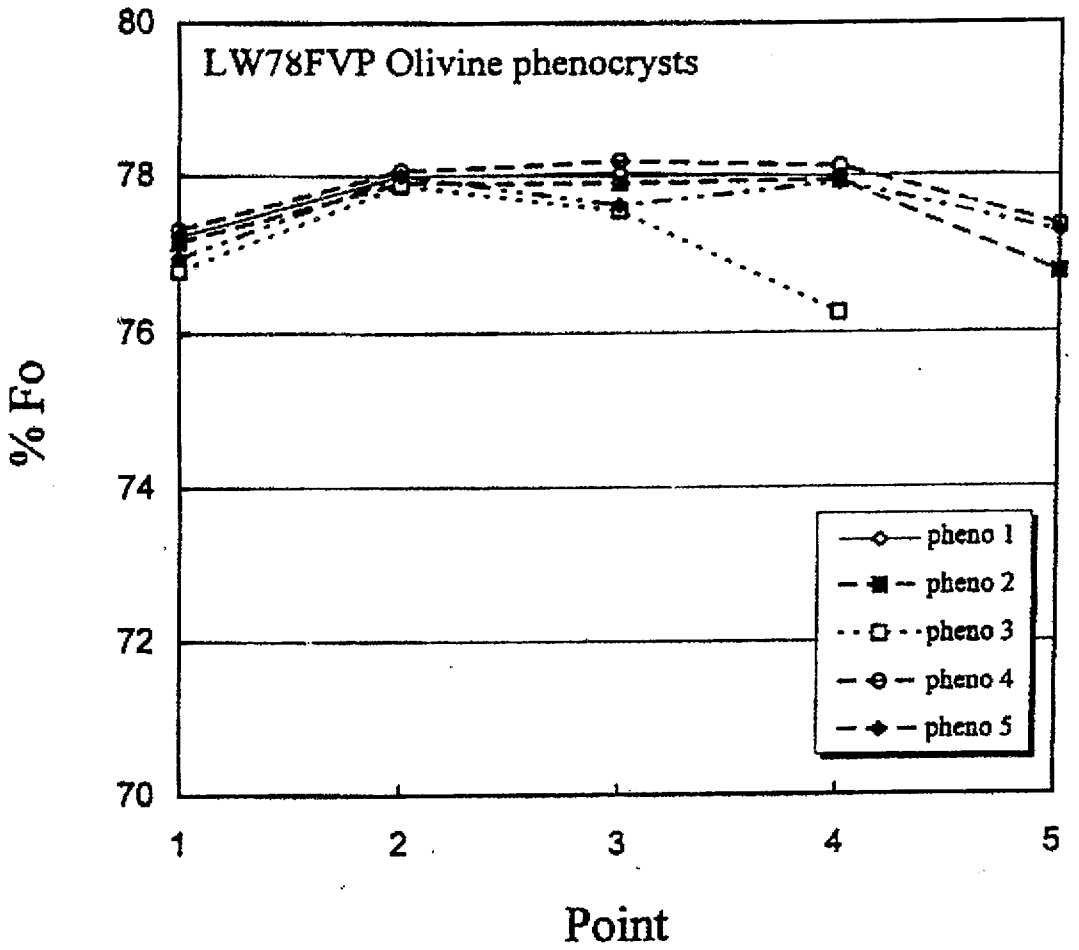

LW80FVP Olivine phenocrysts
80
78
76
74
72
70
% Fo
1
2
3
4
Point
pheno 1
pheno 2a
pheno 2b
pheno 3
pheno 4
pheno 5

Figure 14


LW78FVP Olivine phenocrysts
80
78
76
74
72
70
% Fo
1
2
3
4
5
Point
pheno 1
pheno 2
pheno 3
pheno 4
pheno 5

EXAMPLE

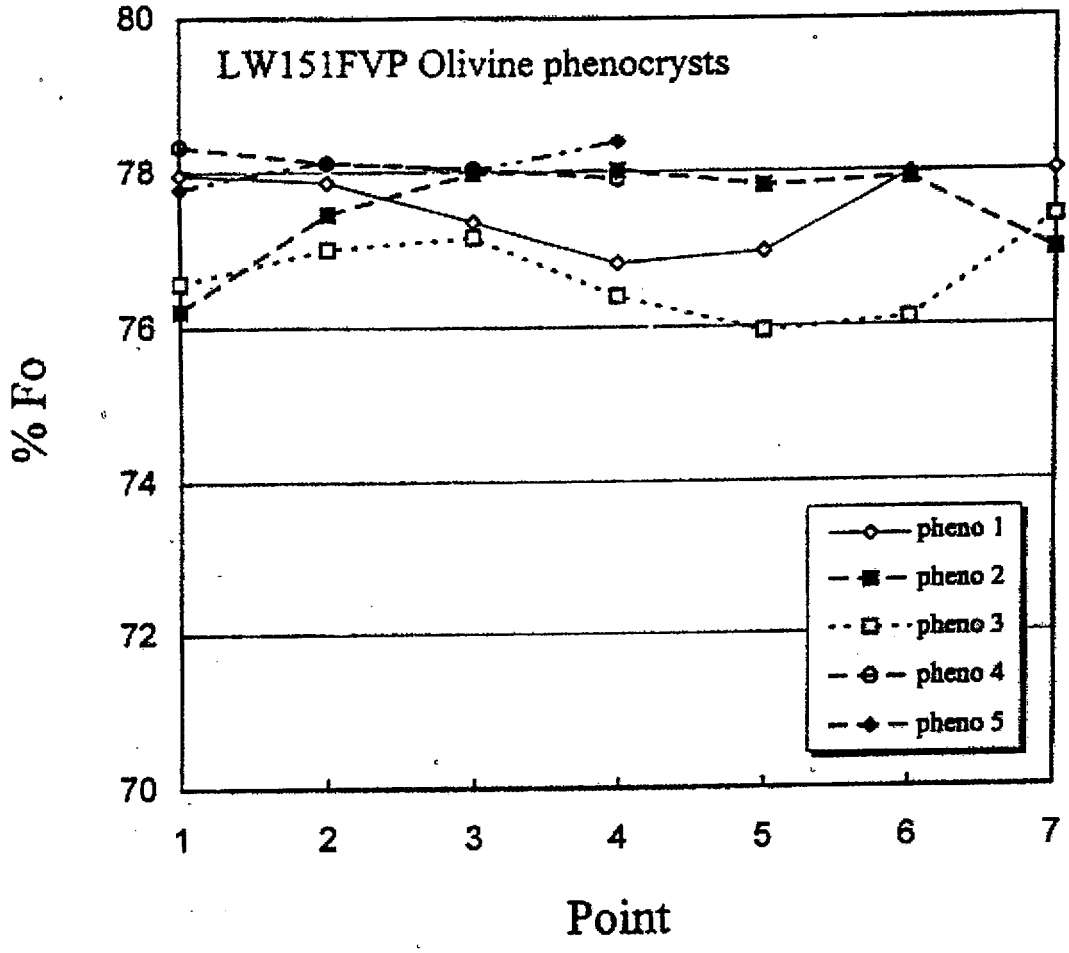
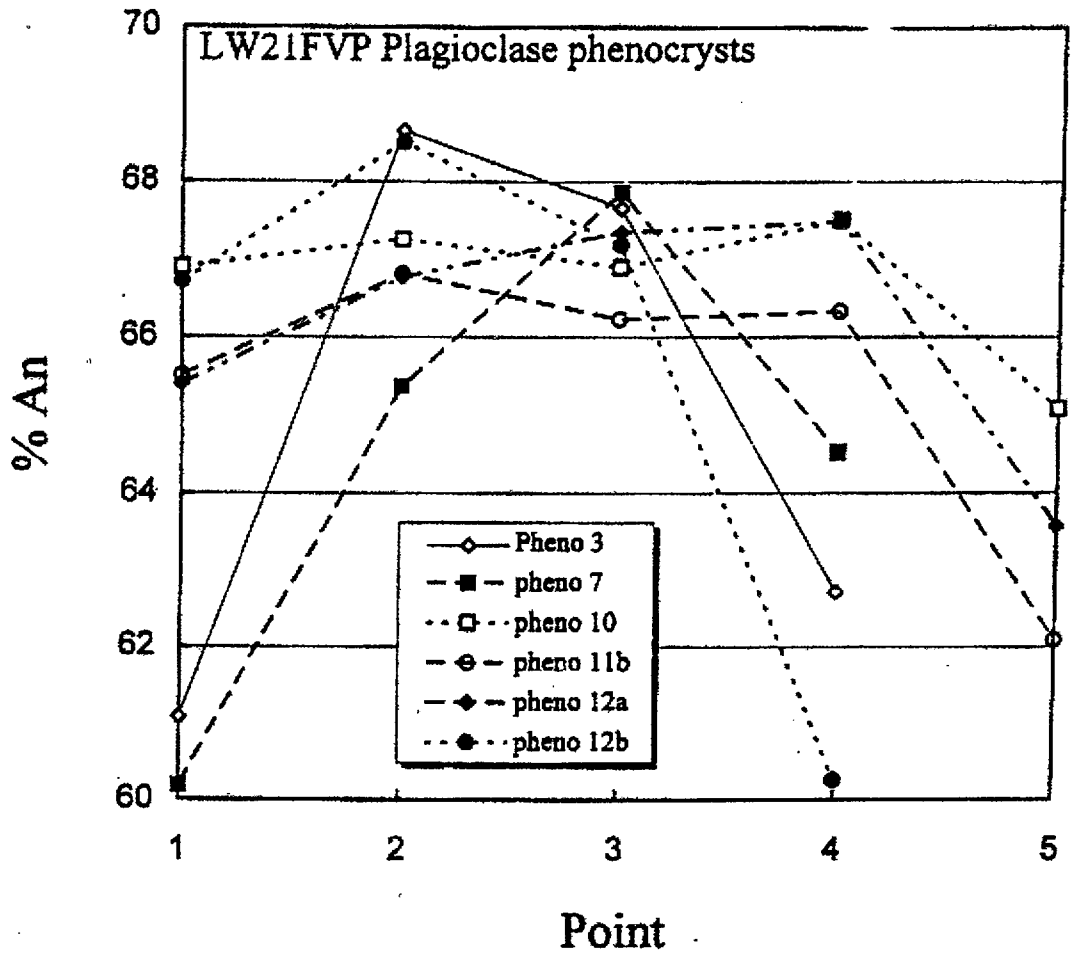

LW151FVP Olivine phenocrysts
80
78
76
74
72
70
% Fo
1
2
3
4
5
6
7
Point
pheno 1
pheno 2
pheno 3
pheno 4
pheno 5

Figure 16



EXAMPLE

Figure 17

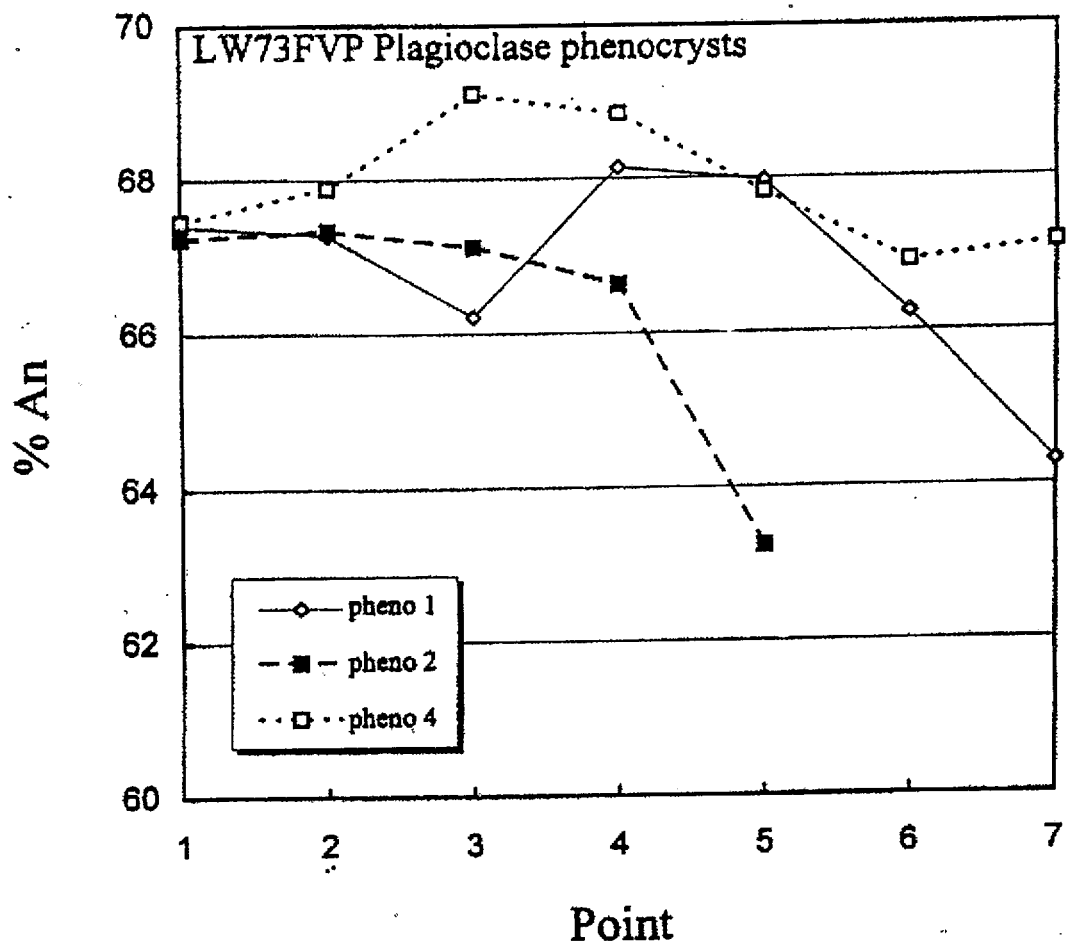
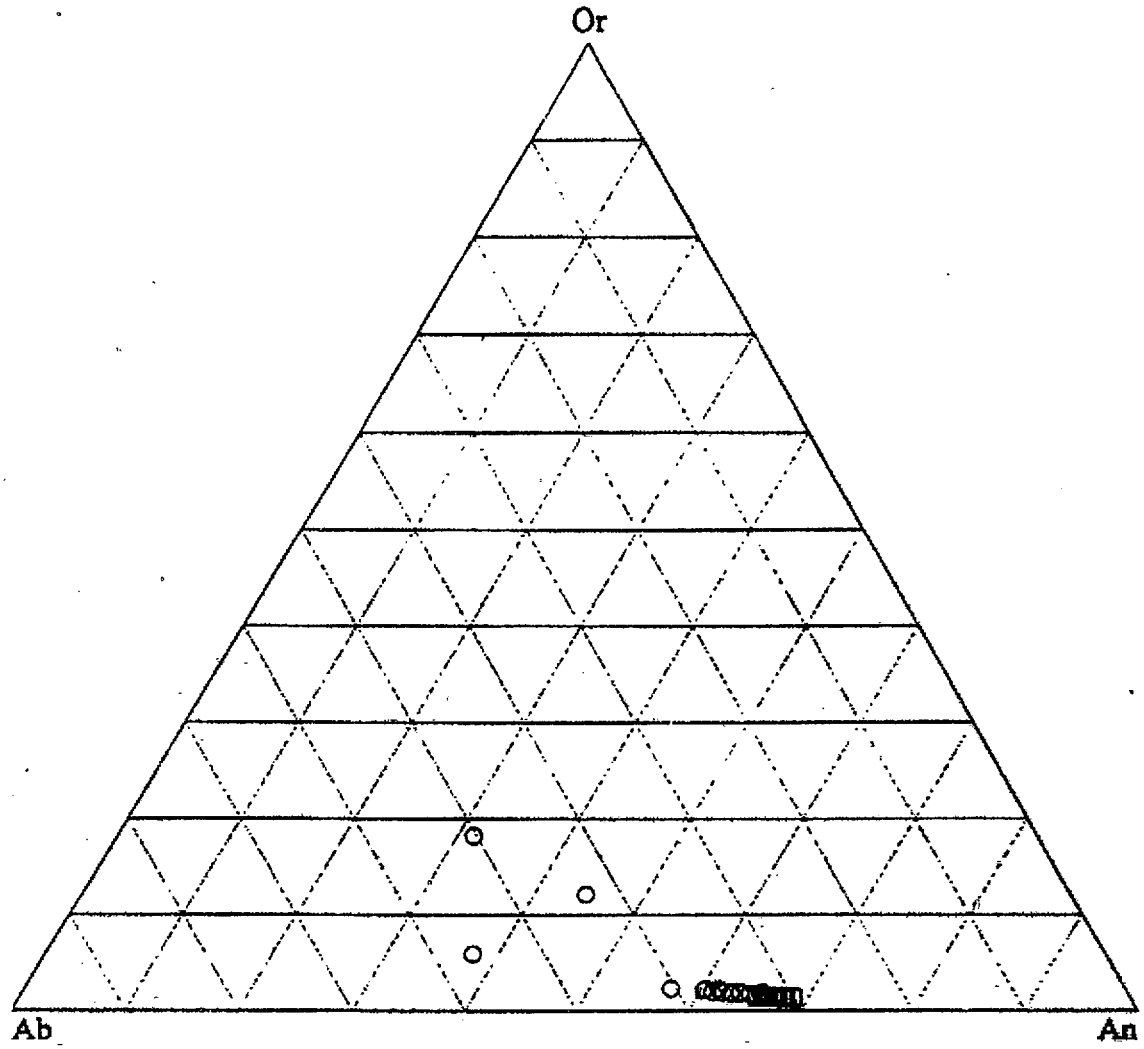

LW73FVP Plagioclase phenocrysts
70
68
66
64
62
60
% An
1
2
3
4
5
6
7
Point
pheno 1
pheno 2
pheno 4

Figure 18

LW21FVP plagioclase compositions



EXAMPLE

Figure 19

LW73FVP plagioclase compositions

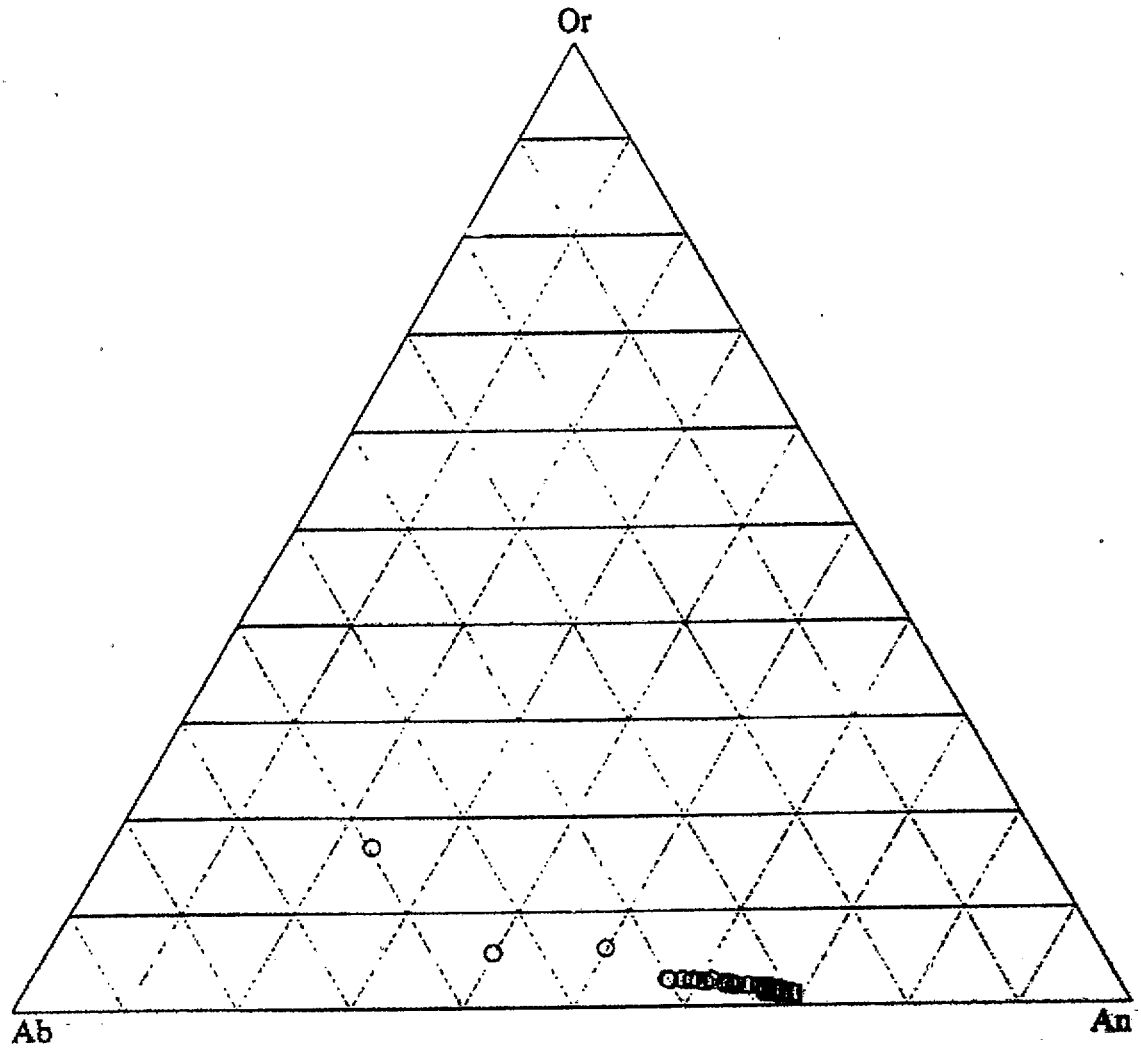
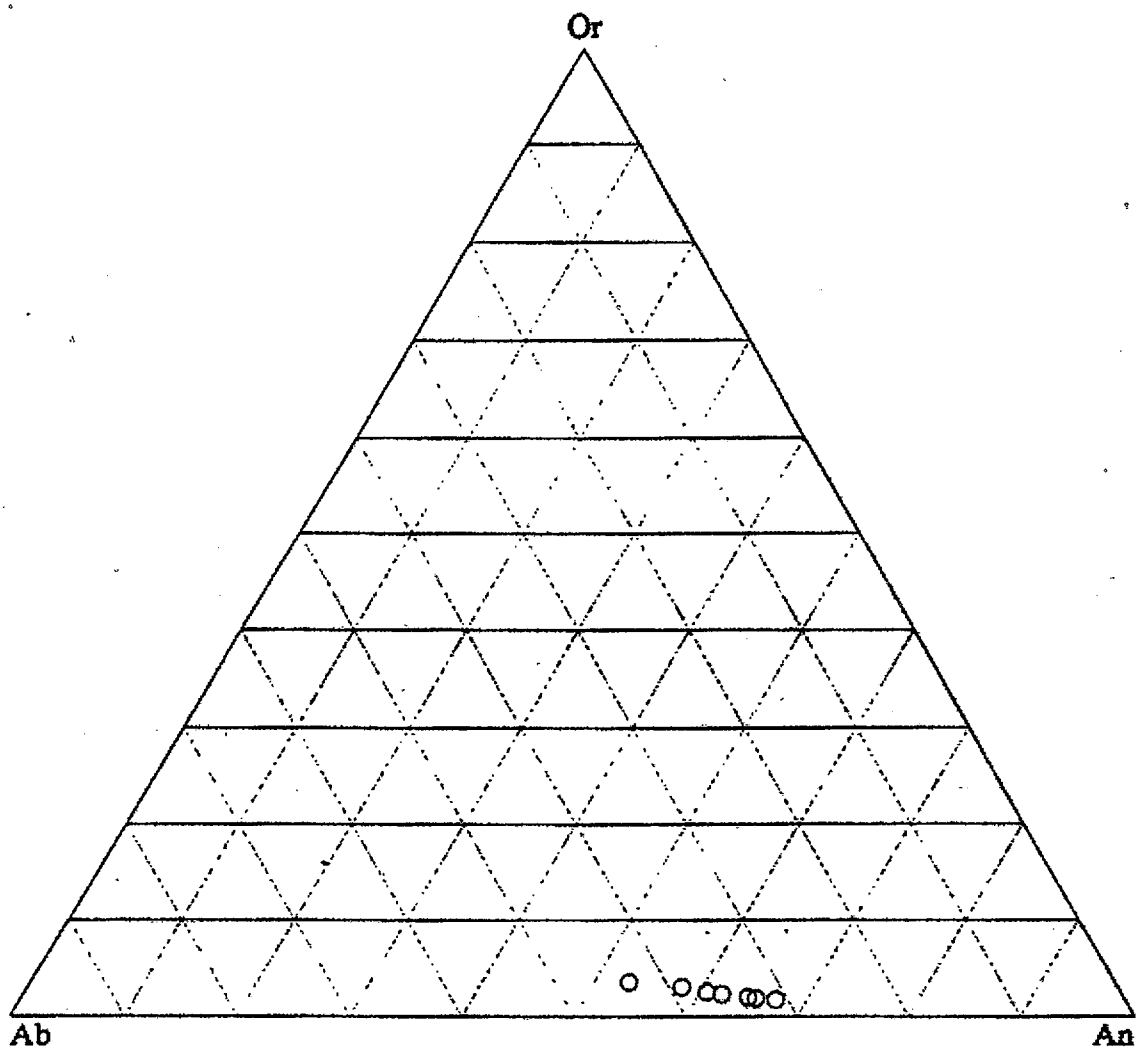


Figure 20

LW40FVP plagioclase compositions



EXAMPLE

Figure 21

LW61FVP plagioclase compositions

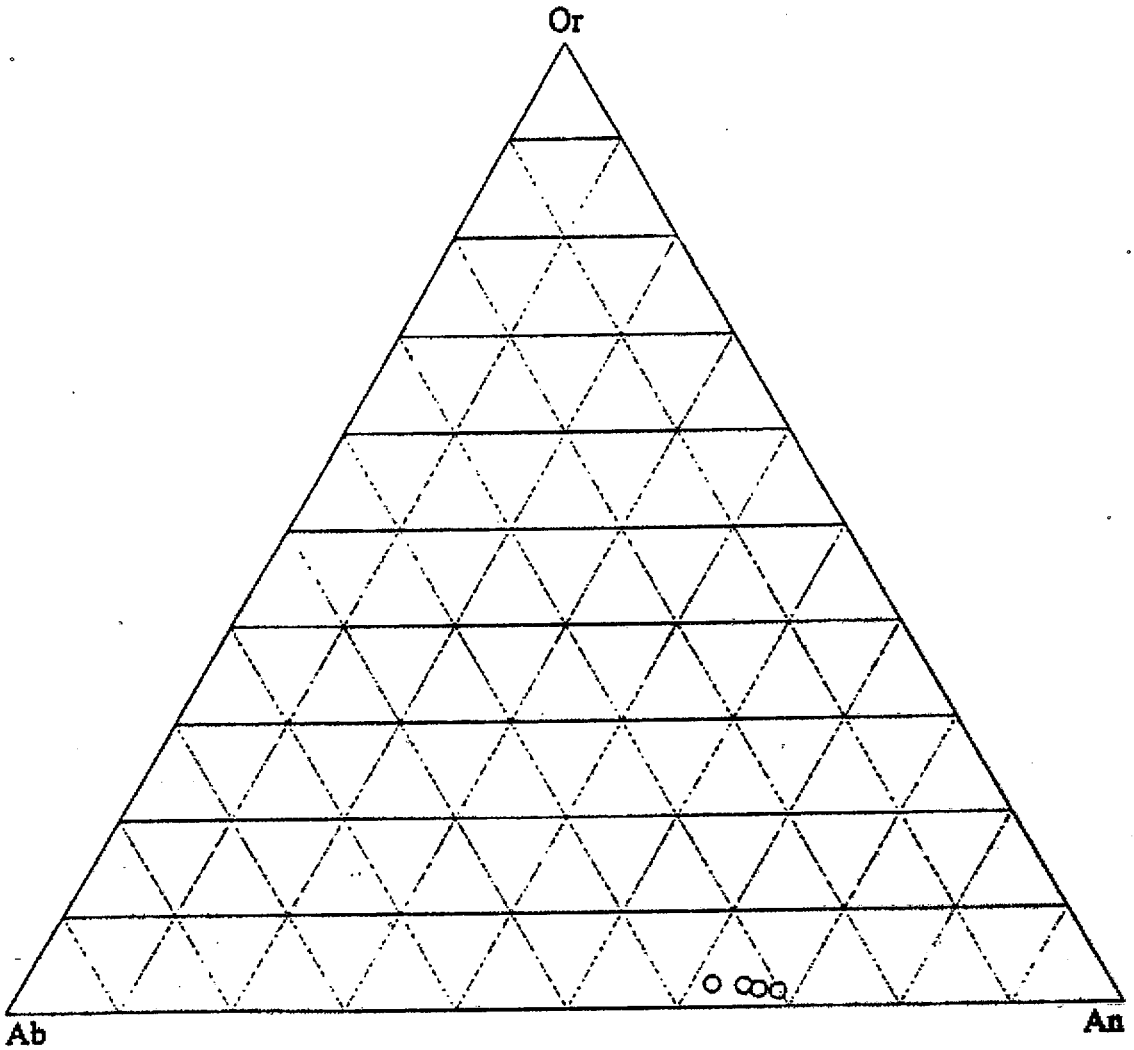
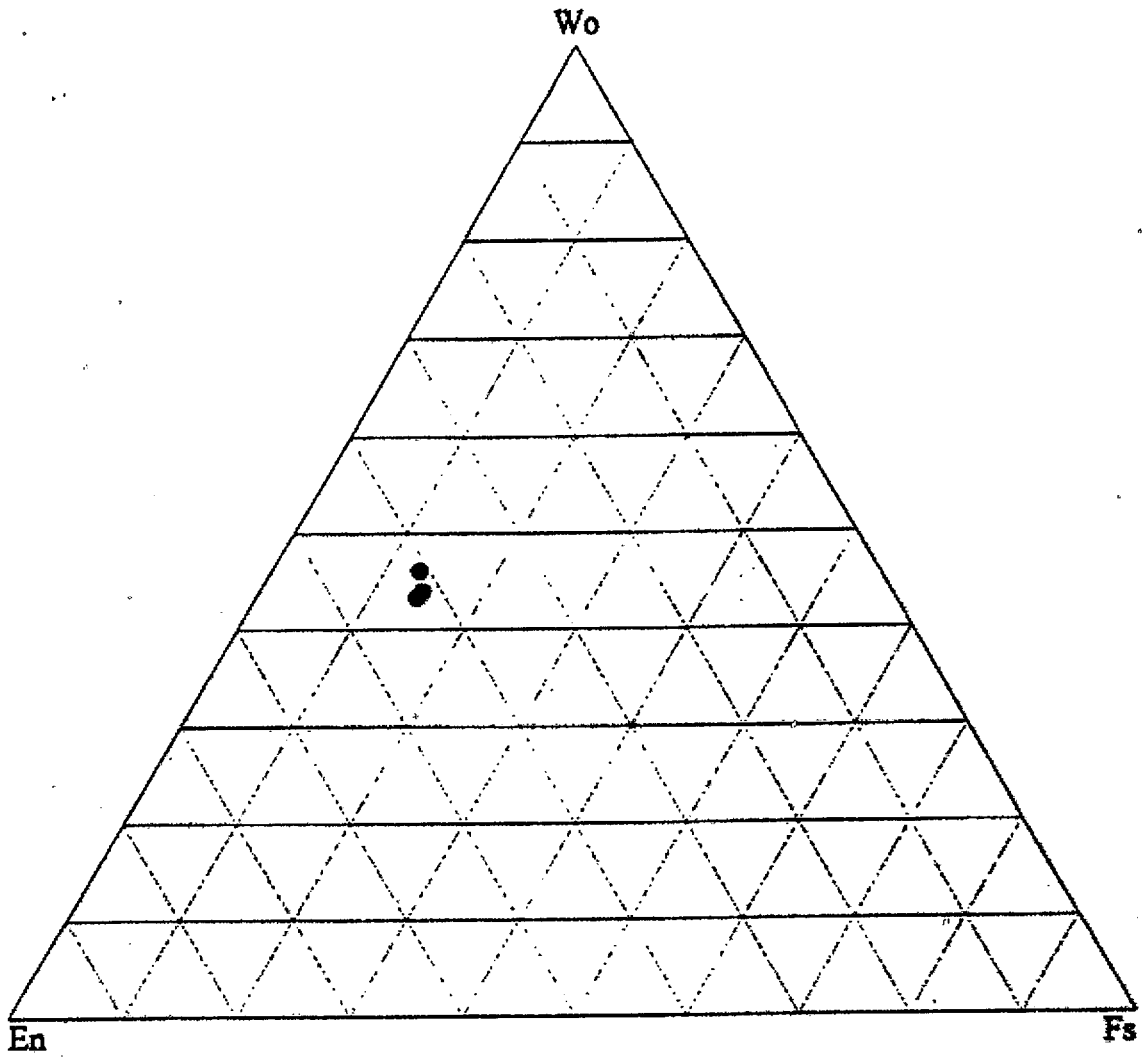


Figure 22

LW21FVP pyroxene compositions



EXAMPLE

Figure 23

LW40FVP pyroxene compositions

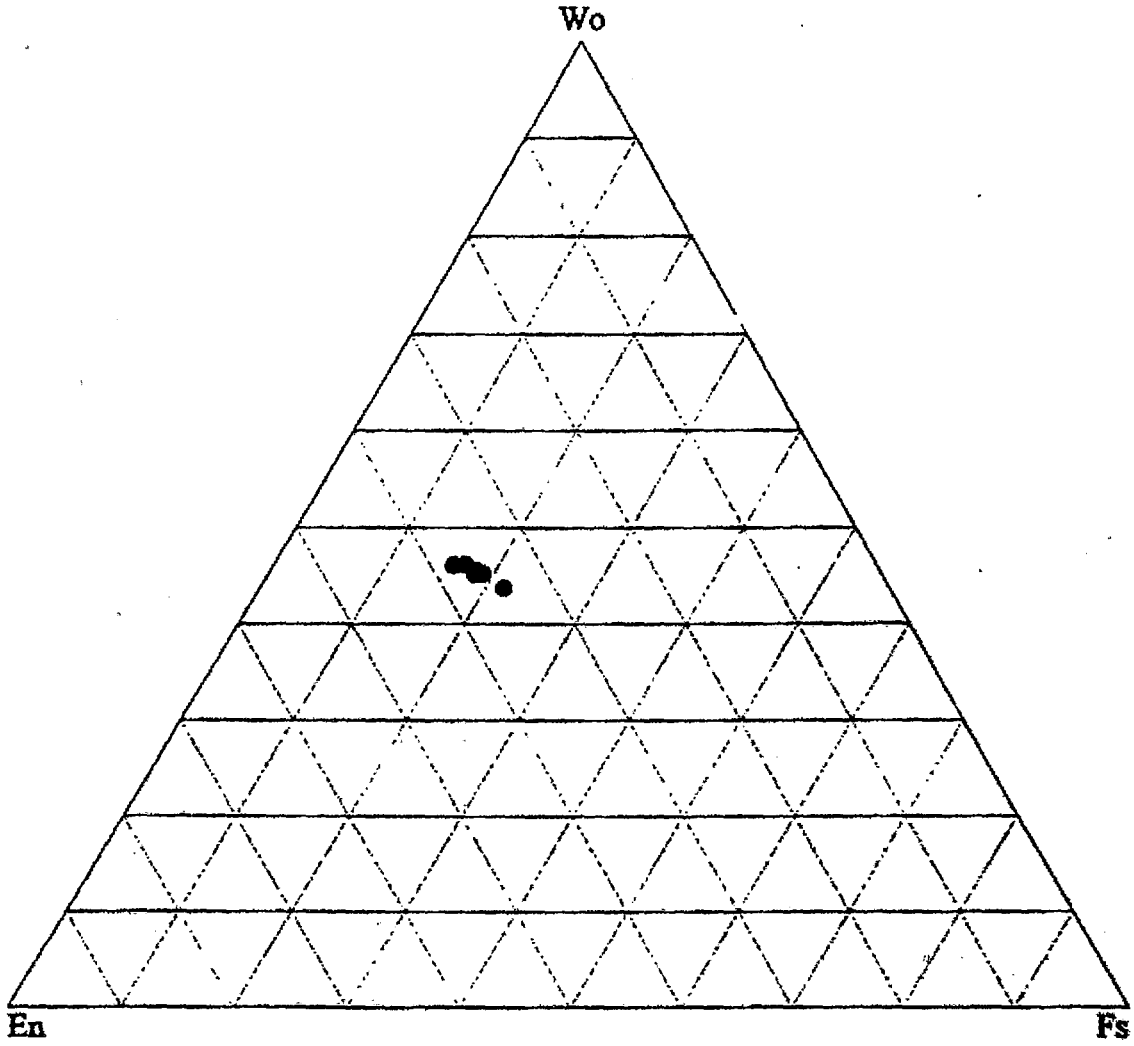
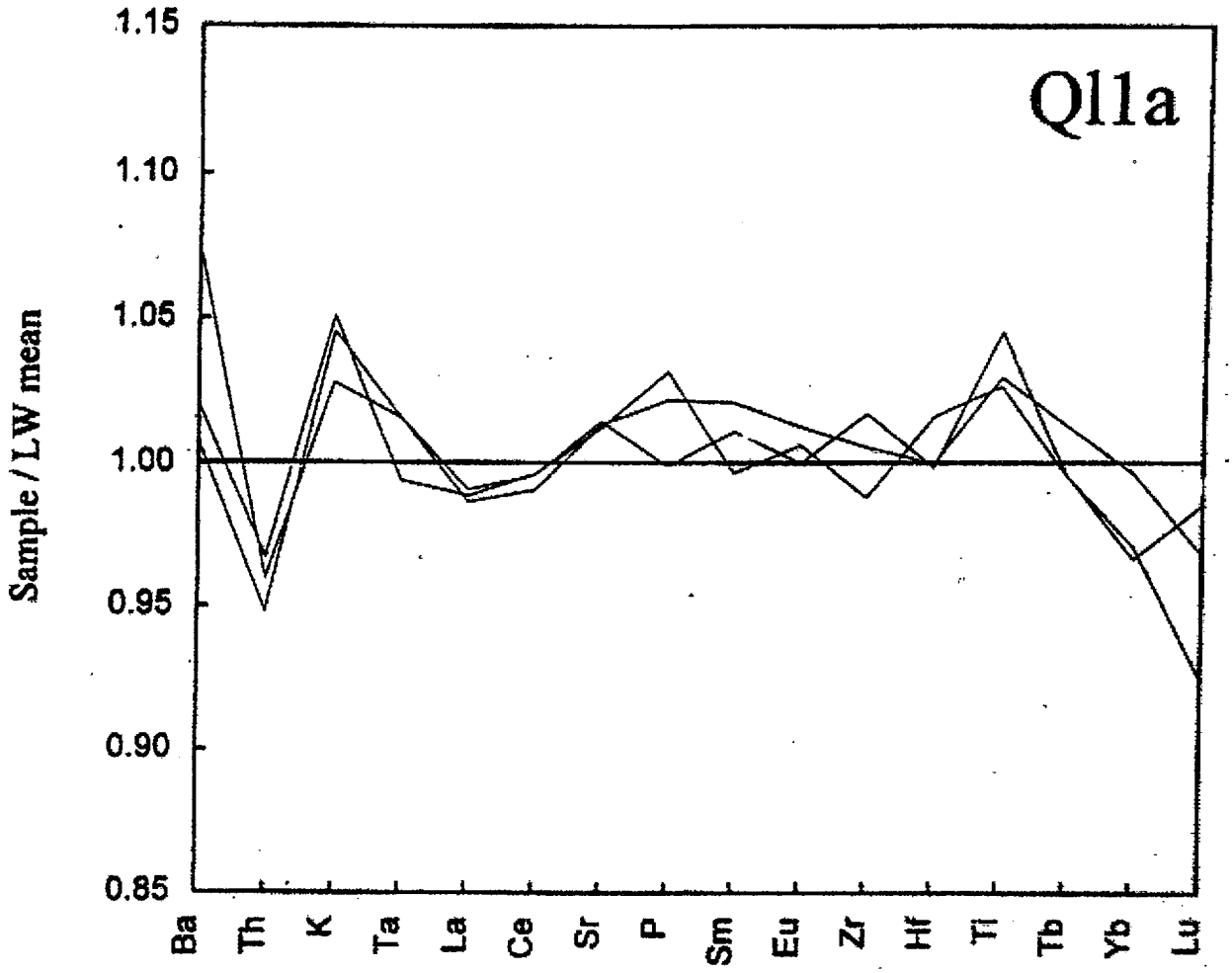


Figure 24



EXAMPLE

Figure 25

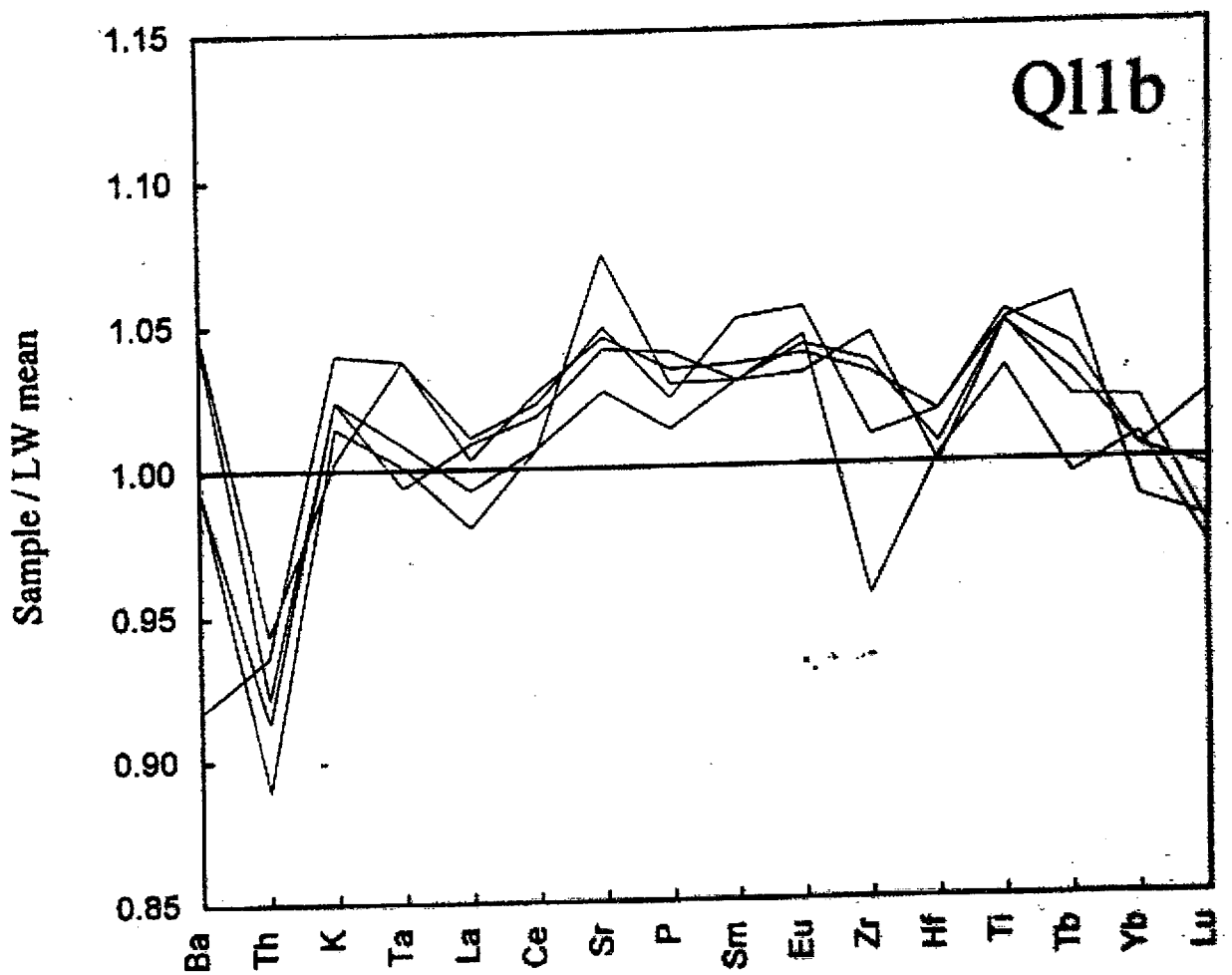
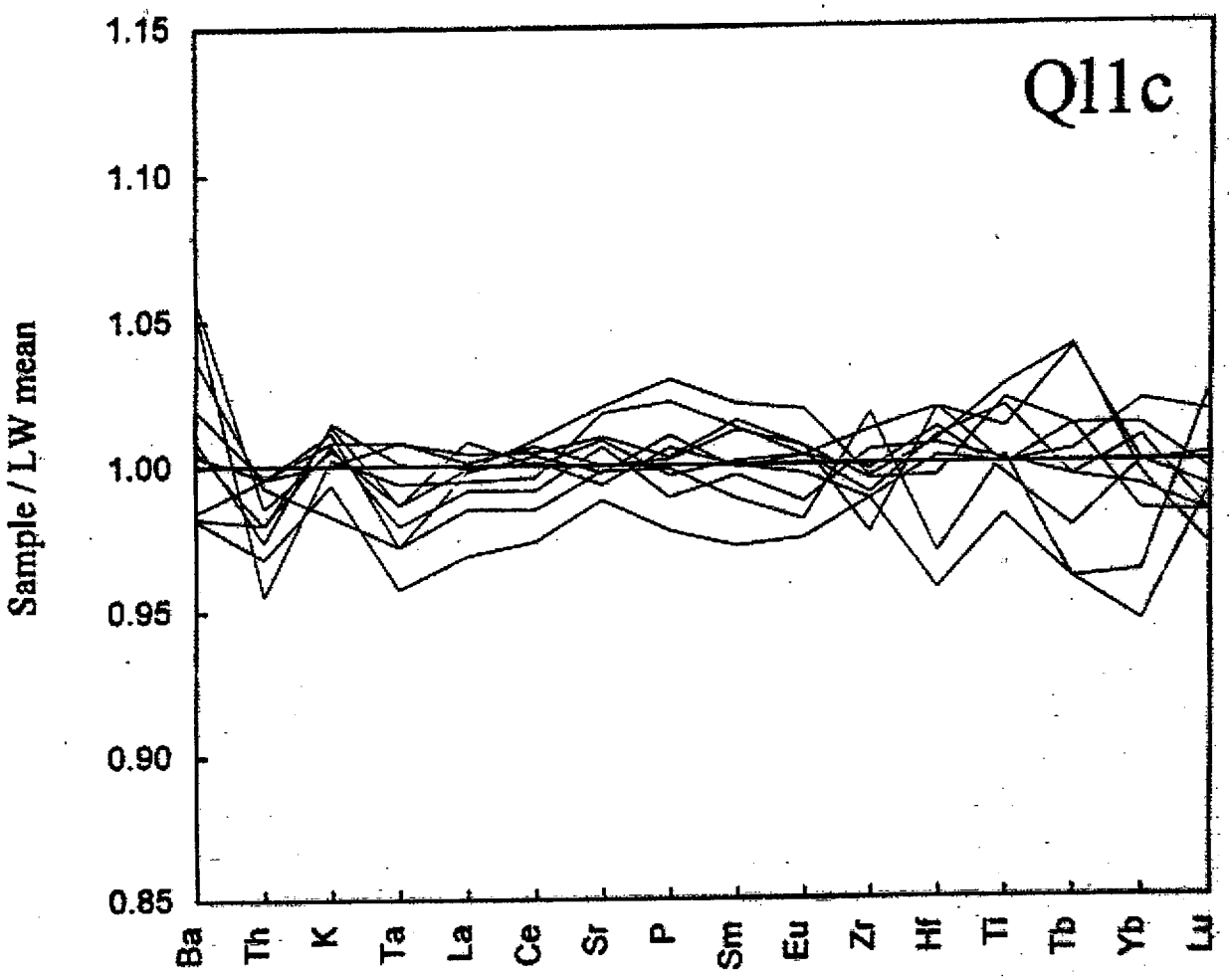

Q11b
Sample / LW mean
1.15
1.10
1.05
1.00
0.95
0.90
0.85
Ba
Th
K
Ta
La
Ce
Sr
P
Sm
Eu
Zr
Hf
Ti
Tb
Yb
Lu

Figure 26



EXAMPLE

Figure 27

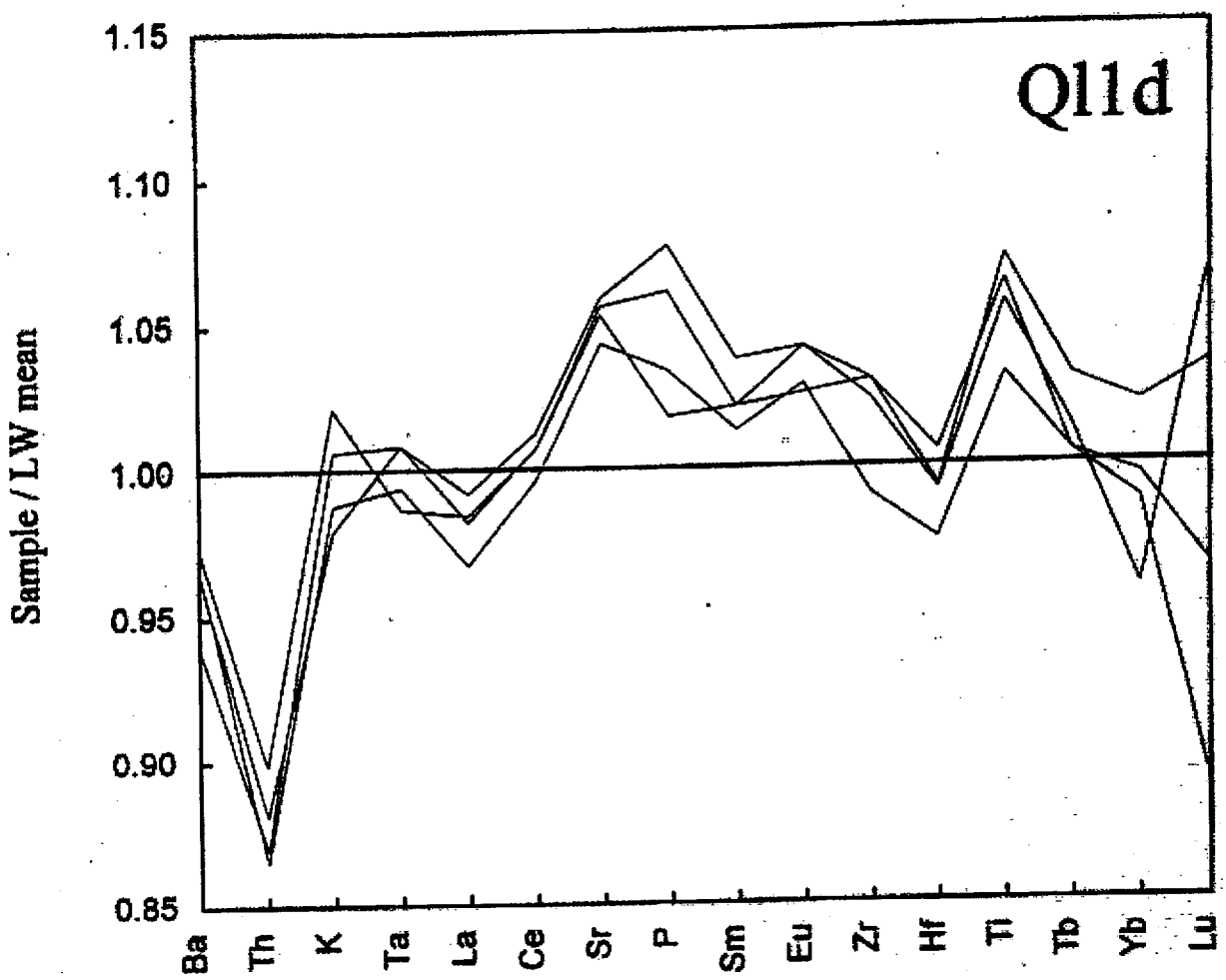
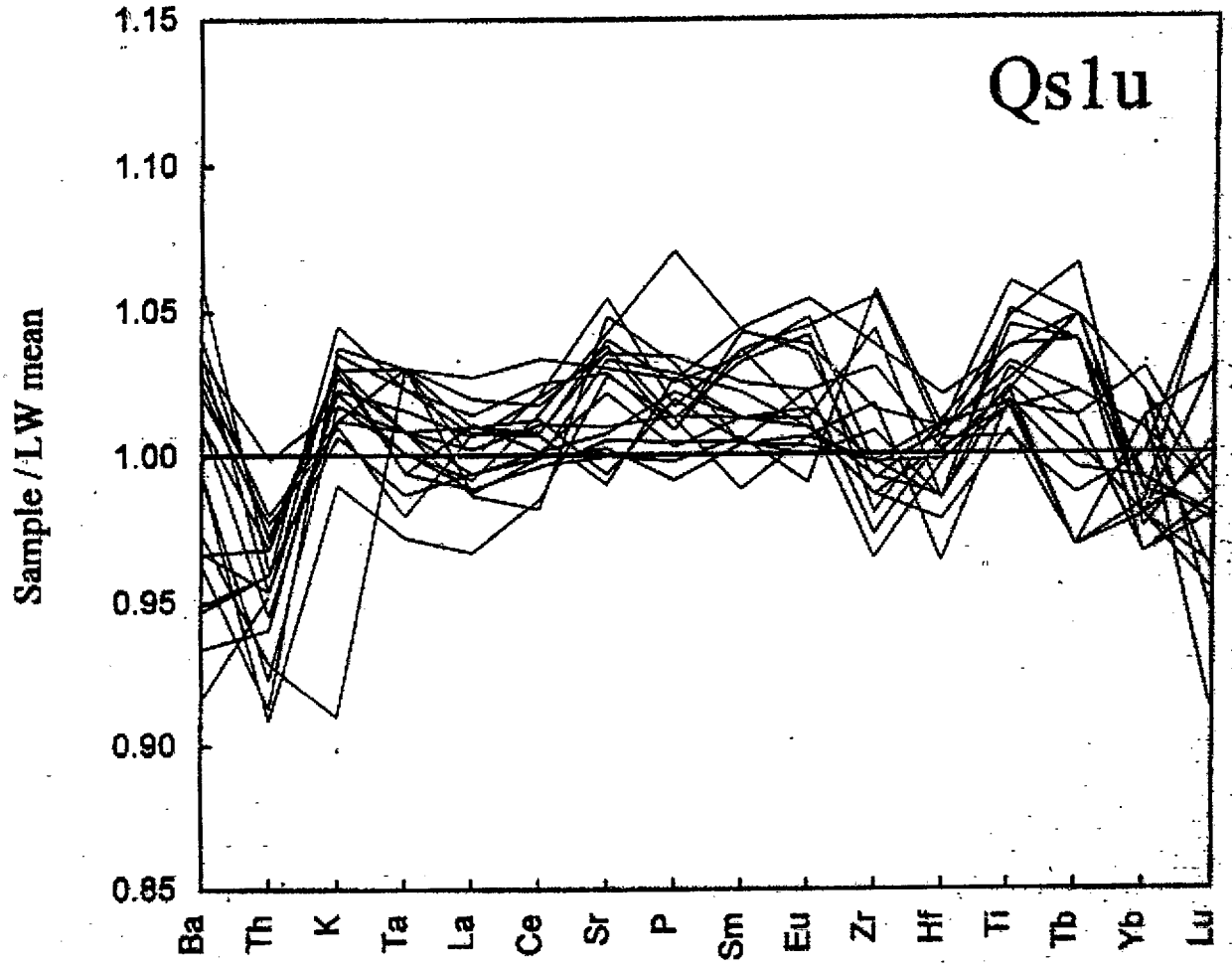

Ql1d
Sample / LW mean
1.15
1.10
1.05
1.00
0.95
0.90
0.85
Ba
Th
K
Ta
La
Ce
Sr
P
Sm
Eu
Zr
Hf
Ti
Tb
Yb
Lu

Figure 28



EXAMPLE

Figure 29

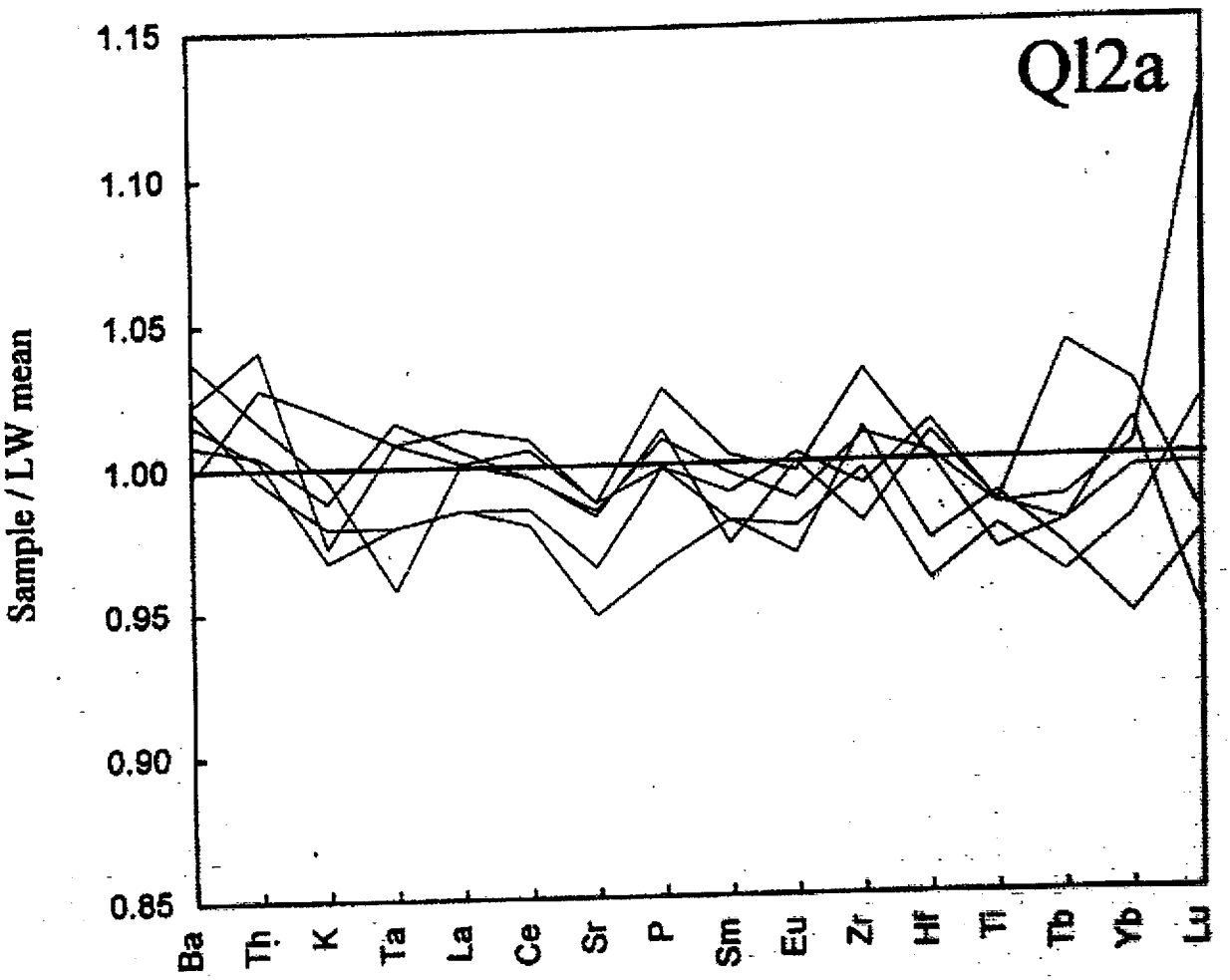
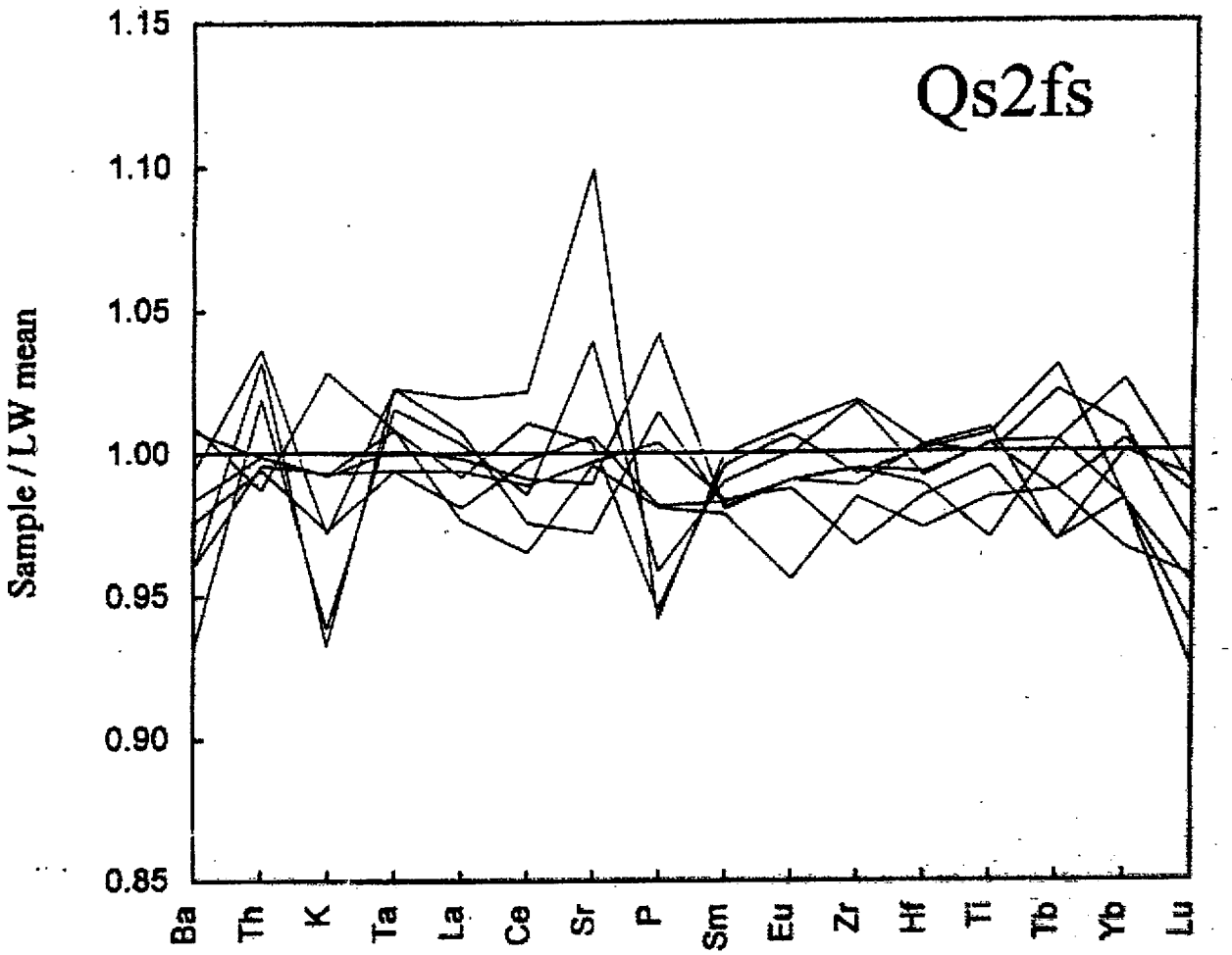

Q12a
Sample / LW mean
1.15
1.10
1.05
1.00
0.95
0.90
0.85
Ba
Th
K
Ta
La
Ce
Sr
P
Sm
Eu
Zr
Hf
Ti
Tb
Yb
Lu

Figure 30



EXAMPLE

Figure 31

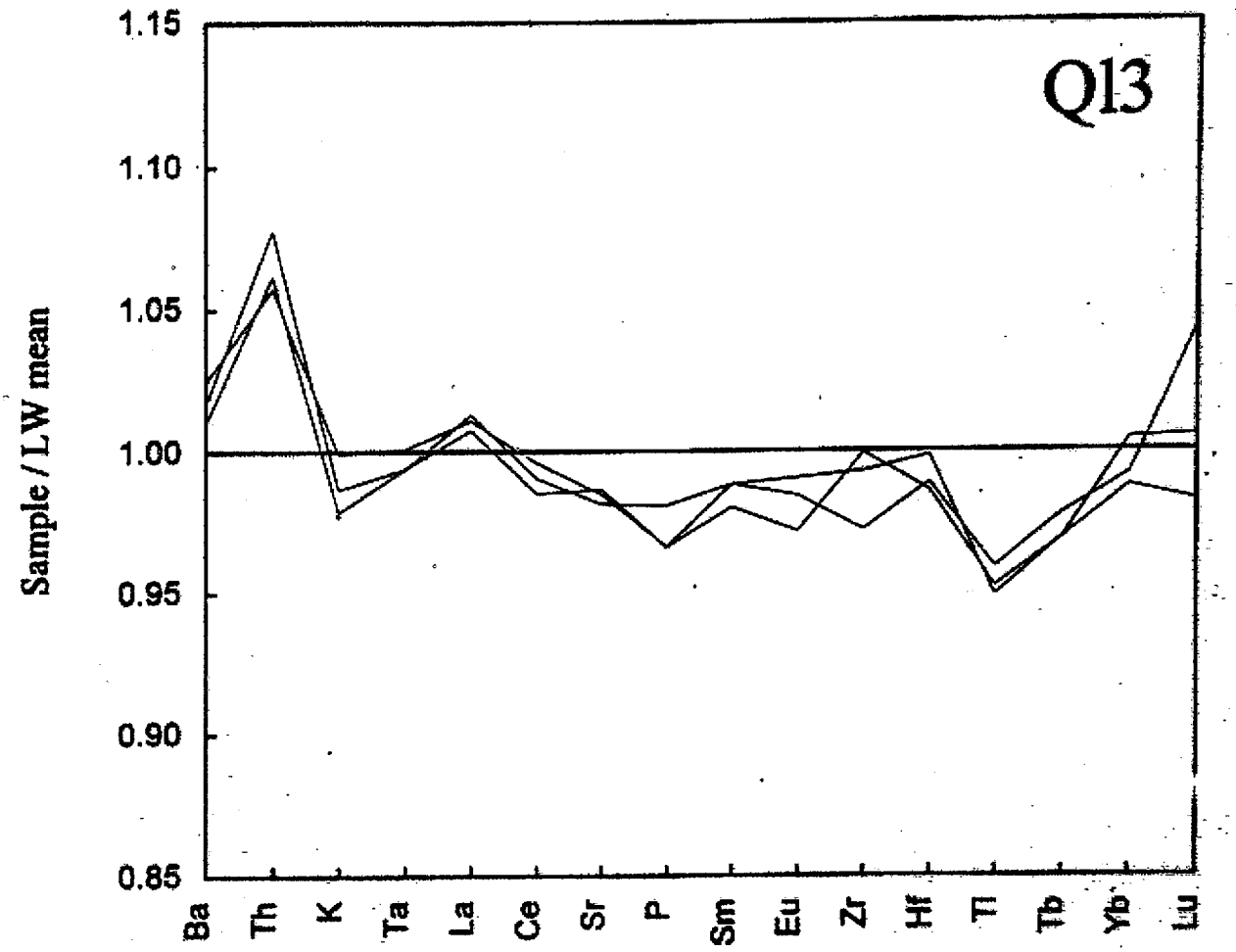
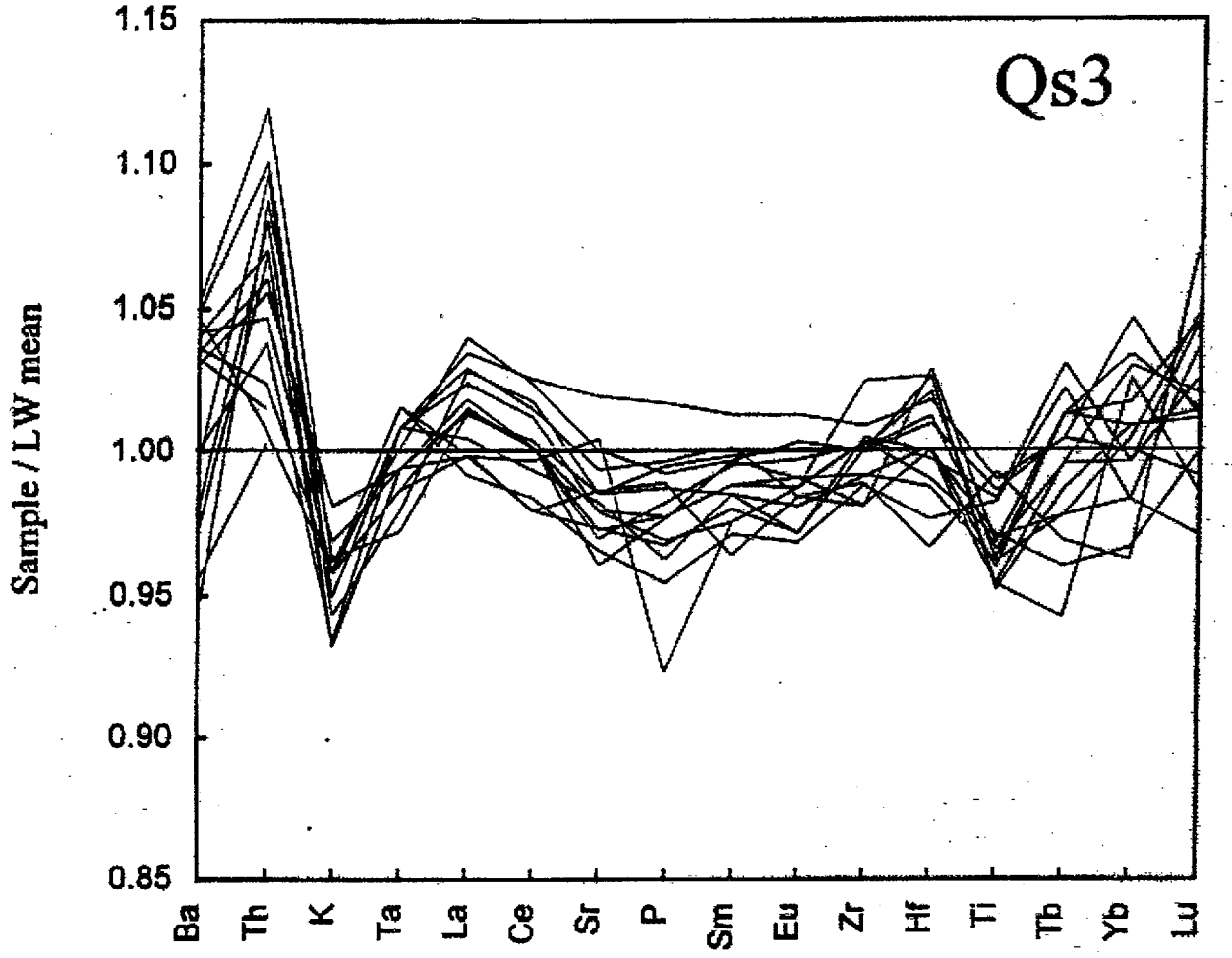

Q13
Sample / LW mean
1.15
1.10
1.05
1.00
0.95
0.90
0.85
Ba
Th
K
Ta
La
Ce
Sr
P
Sm
Eu
Zr
Hf
Ti
Tb
Yb
Lu

Figure 32


Qs3
Sample / LW mean
1.15
1.10
1.05
1.00
0.95
0.90
0.85
Ba
Th
K
Ta
La
Ce
Sr
P
Sm
Eu
Zr
Hf
Ti
Tb
Yb
Lu

EXAMPLE

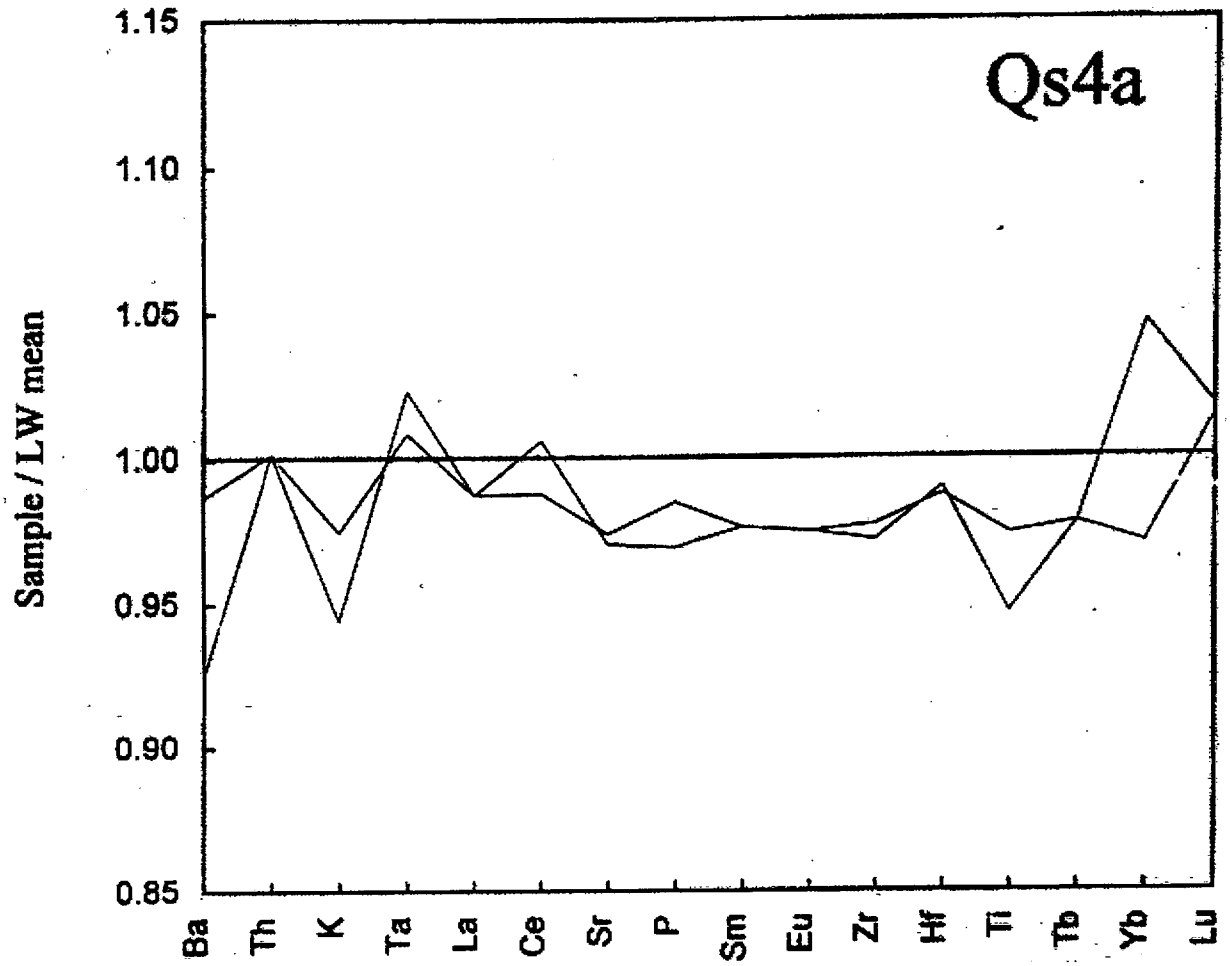
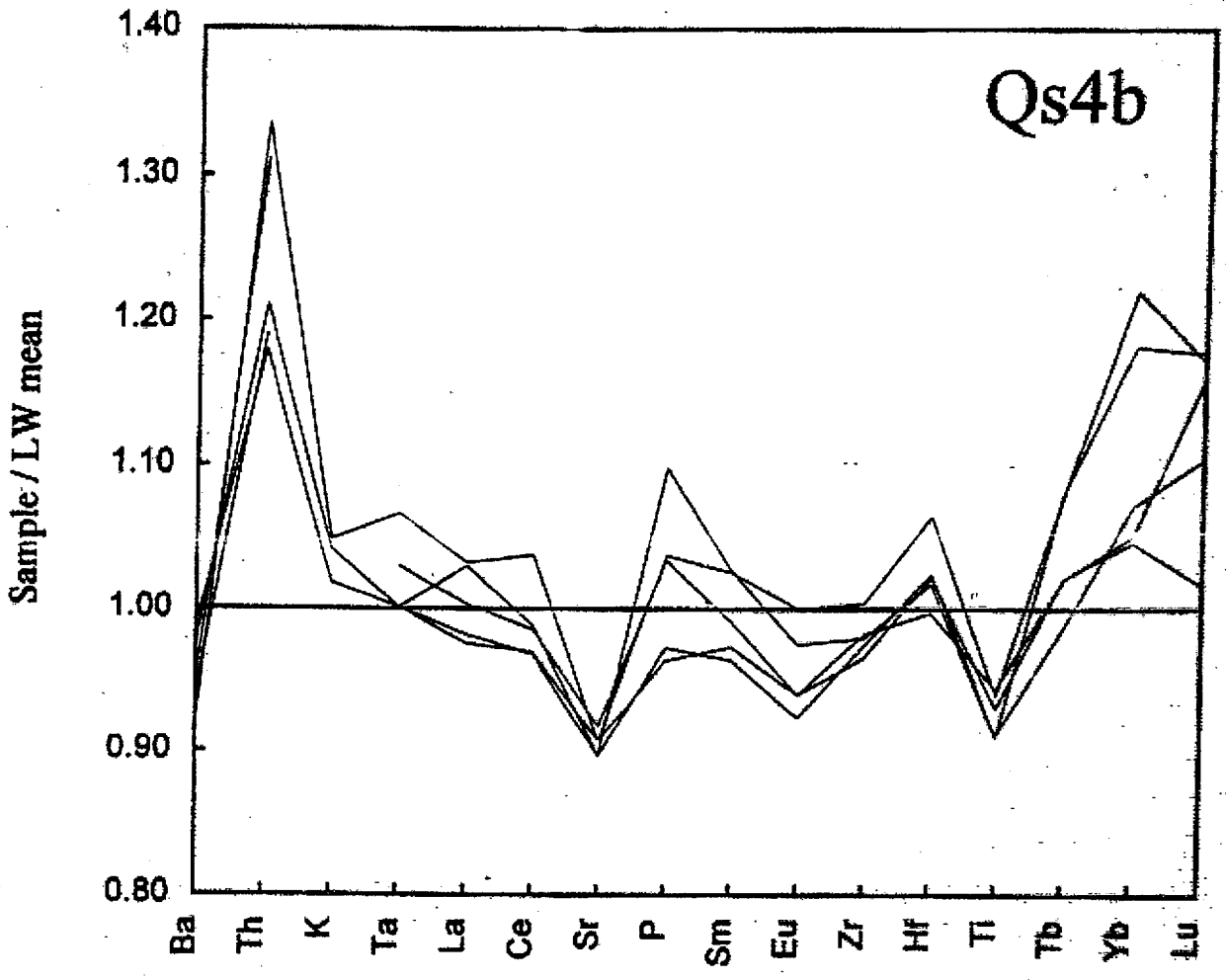

Qs4a
Sample / LW mean
1.15
1.10
1.05
1.00
0.95
0.90
0.85
Ba
Th
K
Ta
La
Ce
Sr
P
Sm
Eu
Zr
Hf
Ti
Tb
Yb
Lu

Figure 34



EXAMPLE

Figure 35

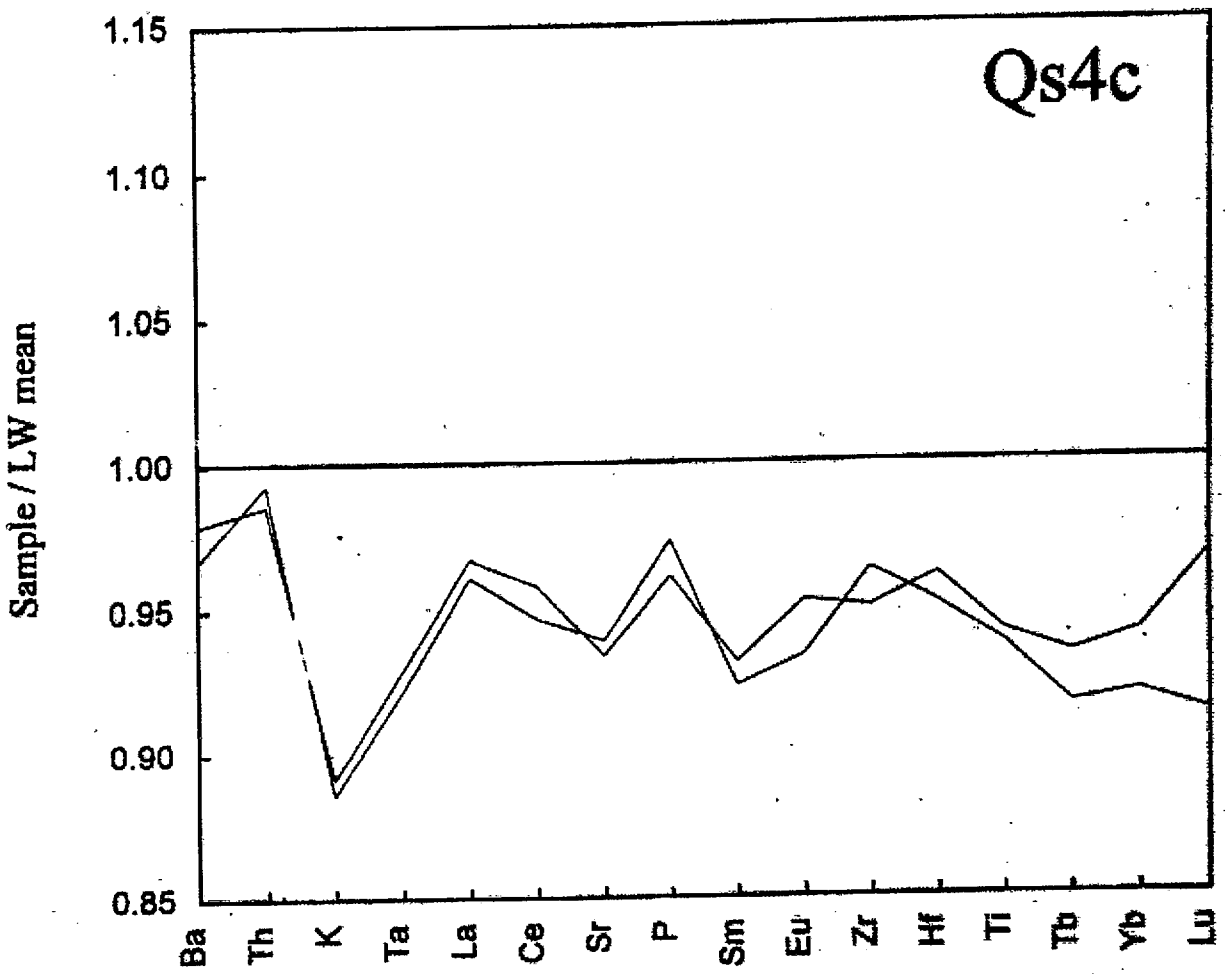
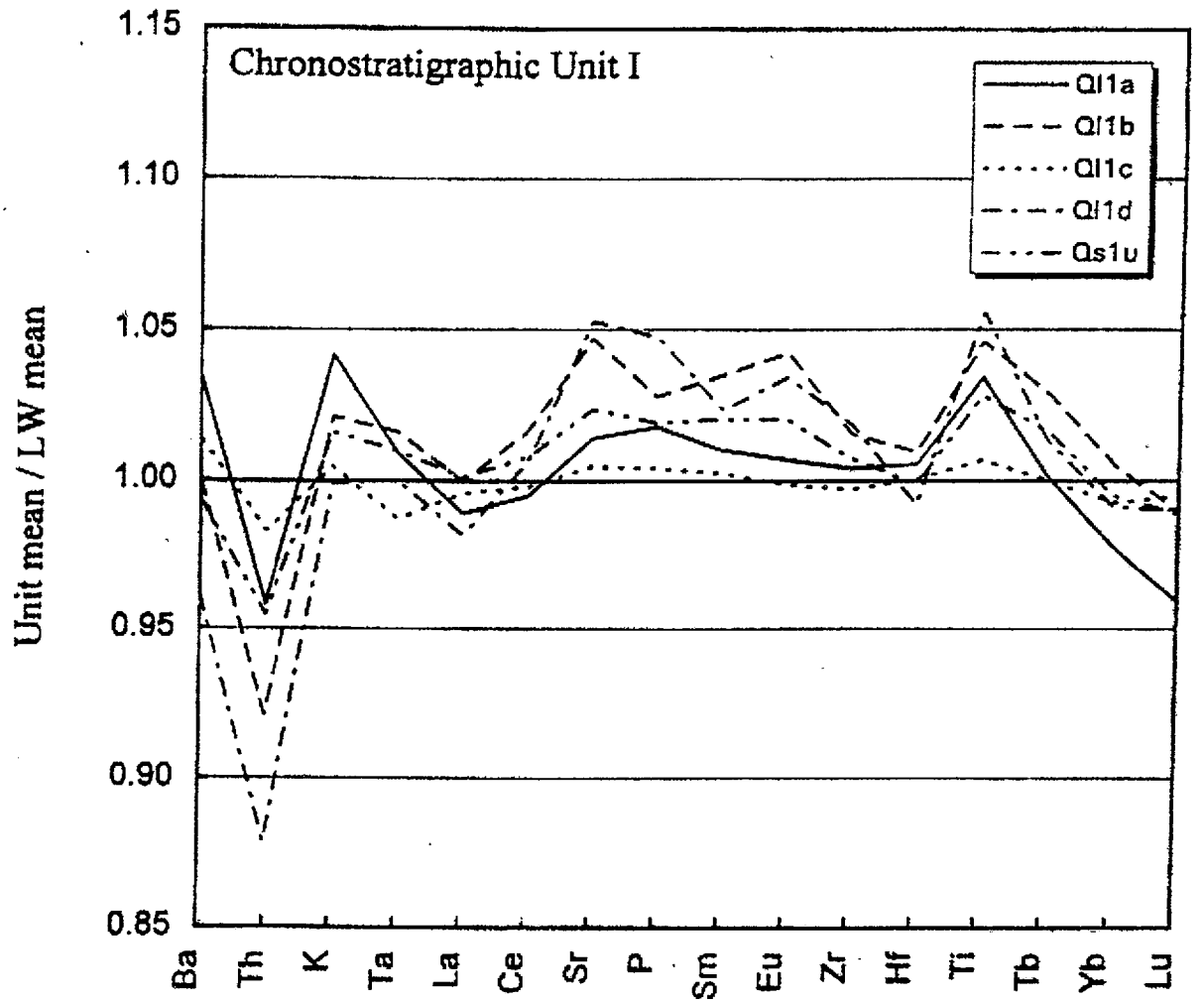

Qs4c
Sample / LW mean
1.15
1.10
1.05
1.00
0.95
0.90
0.85
Ba
Th
K
Ta
La
Ce
Sr
P
Sm
Eu
Zr
Hf
Ti
Tb
Yb
Lu

Figure 36



EXAMPLE

Figure 37

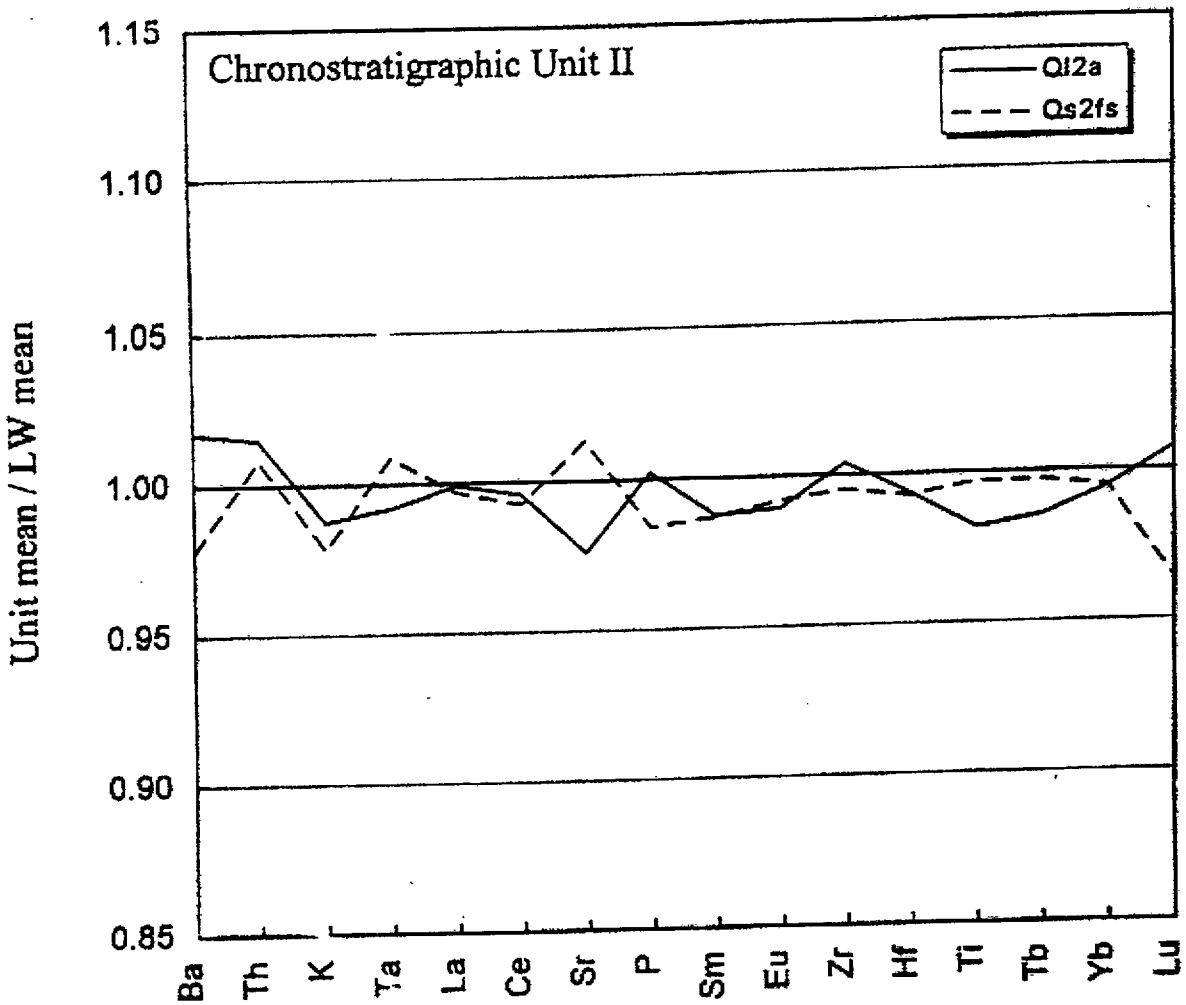
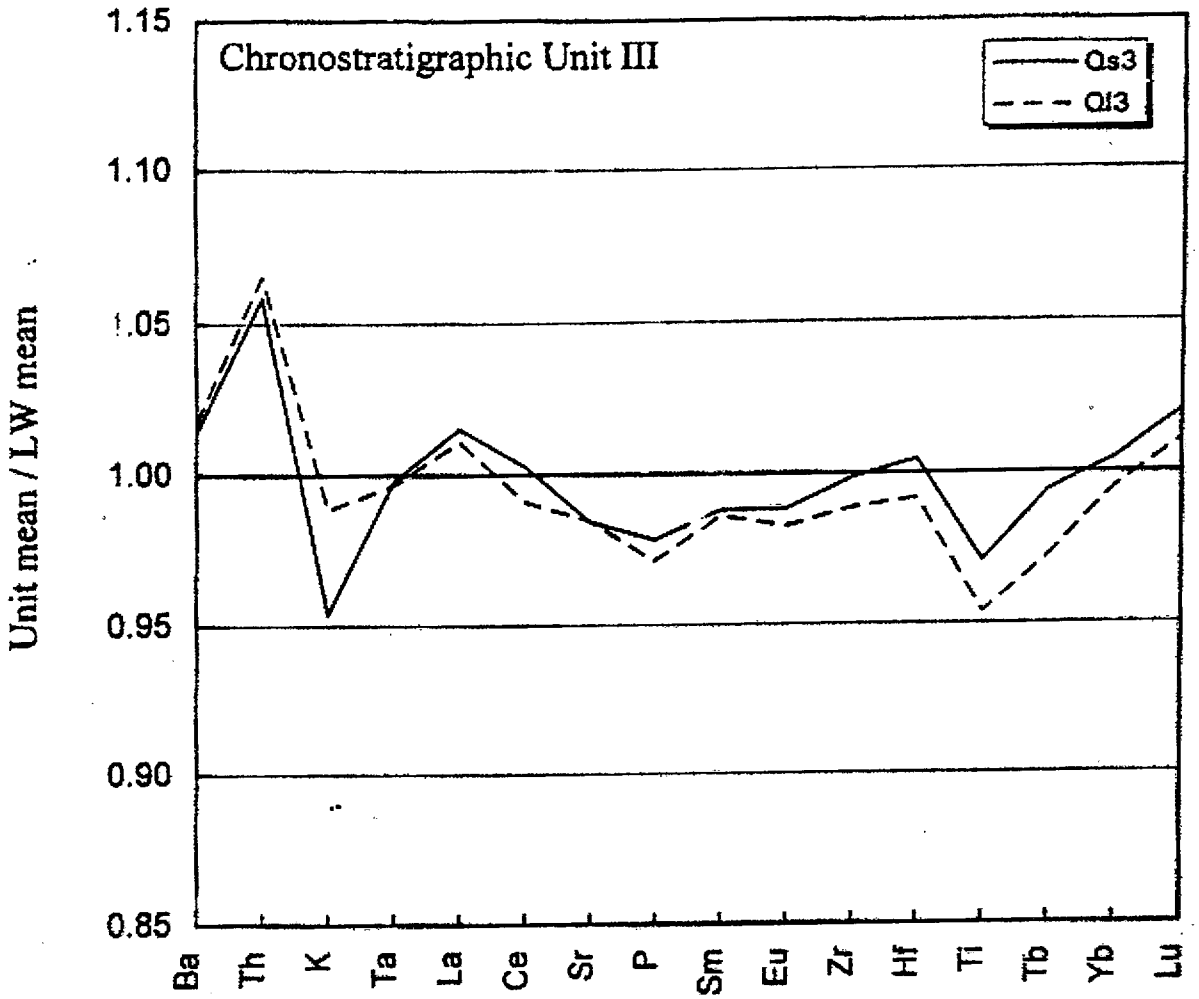

Chronostratigraphic Unit II
Ql2a
Qs2fs
Unit mean / LW mean
1.15
1.10
1.05
1.00
0.95
0.90
0.85
Ba
Th
K
Ta
La
Ce
Sr
P
Sm
Eu
Zr
Hf
Ti
Tb
Yb
Lu

Figure 38



EXAMPLE

Figure 39

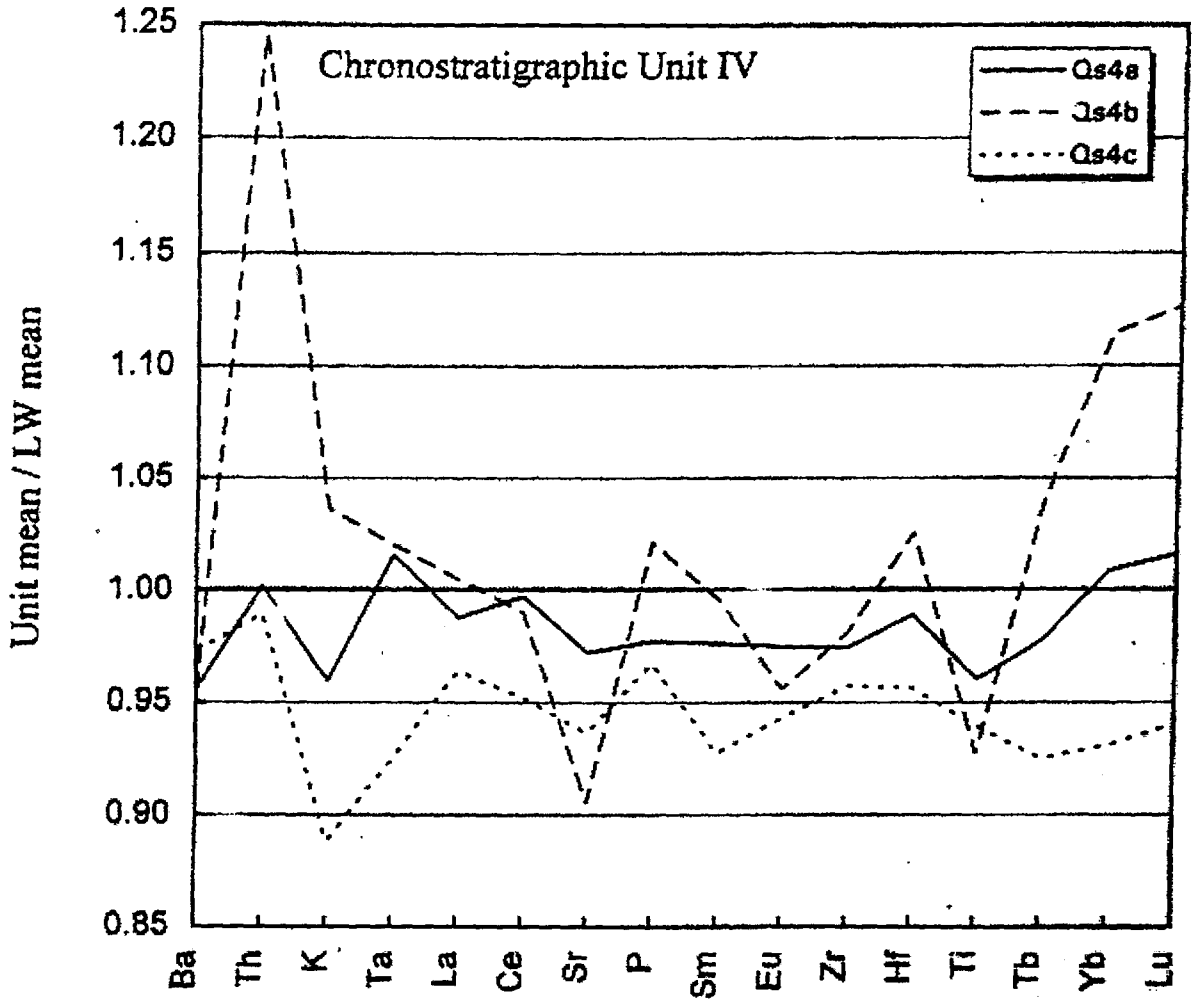
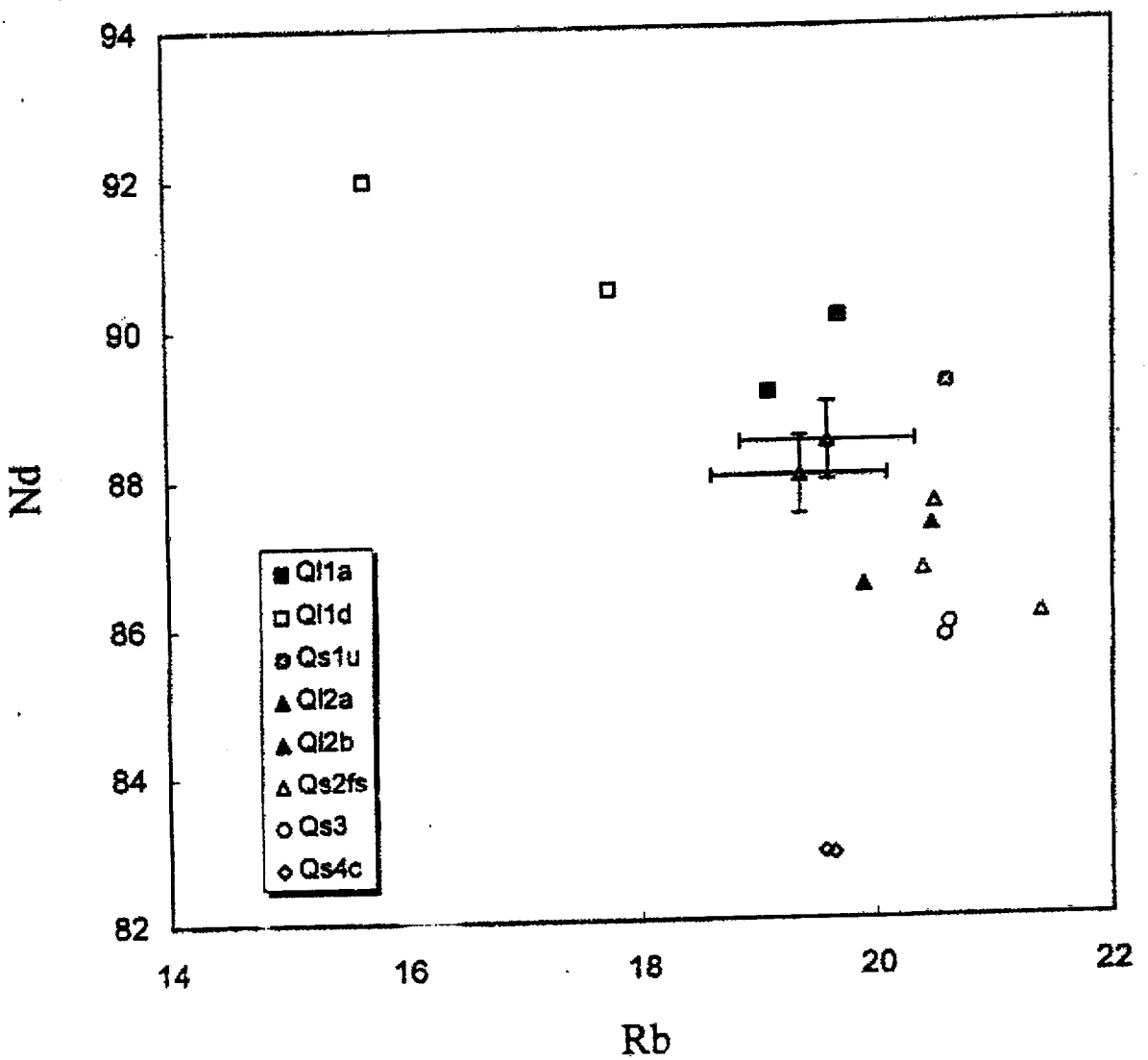

Chronostratigraphic Unit IV
Qs4a
Qs4b
Qs4c
Unit mean / LW mean
1.25
1.20
1.15
1.10
1.05
1.00
0.95
0.90
0.85
Ba
Th
K
Ta
La
Ce
Sr
P
Sm
Eu
Zr
Hf
Ti
Tb
Yb
Lu

Figure 40



XAMPLE

Figure 41

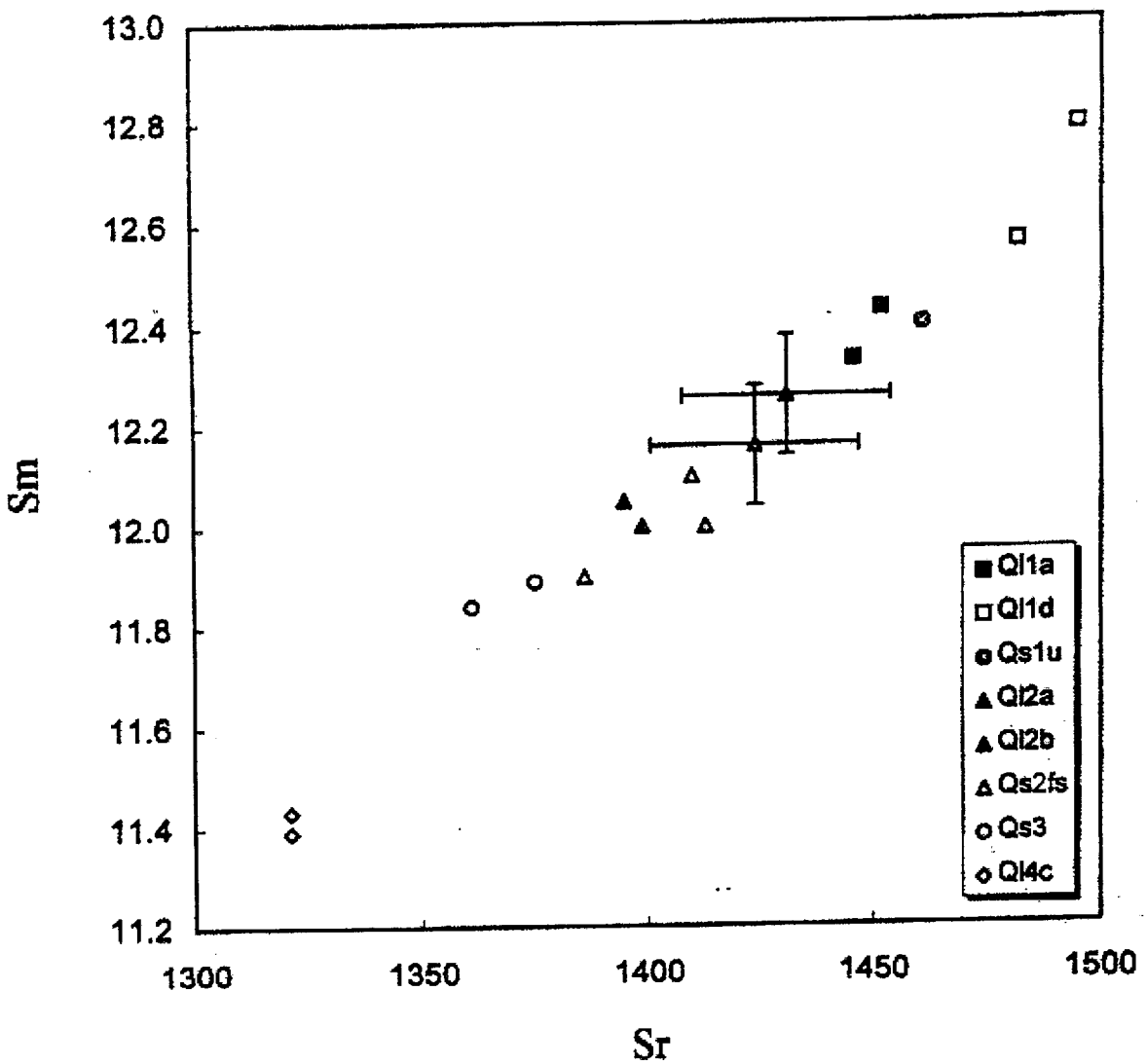
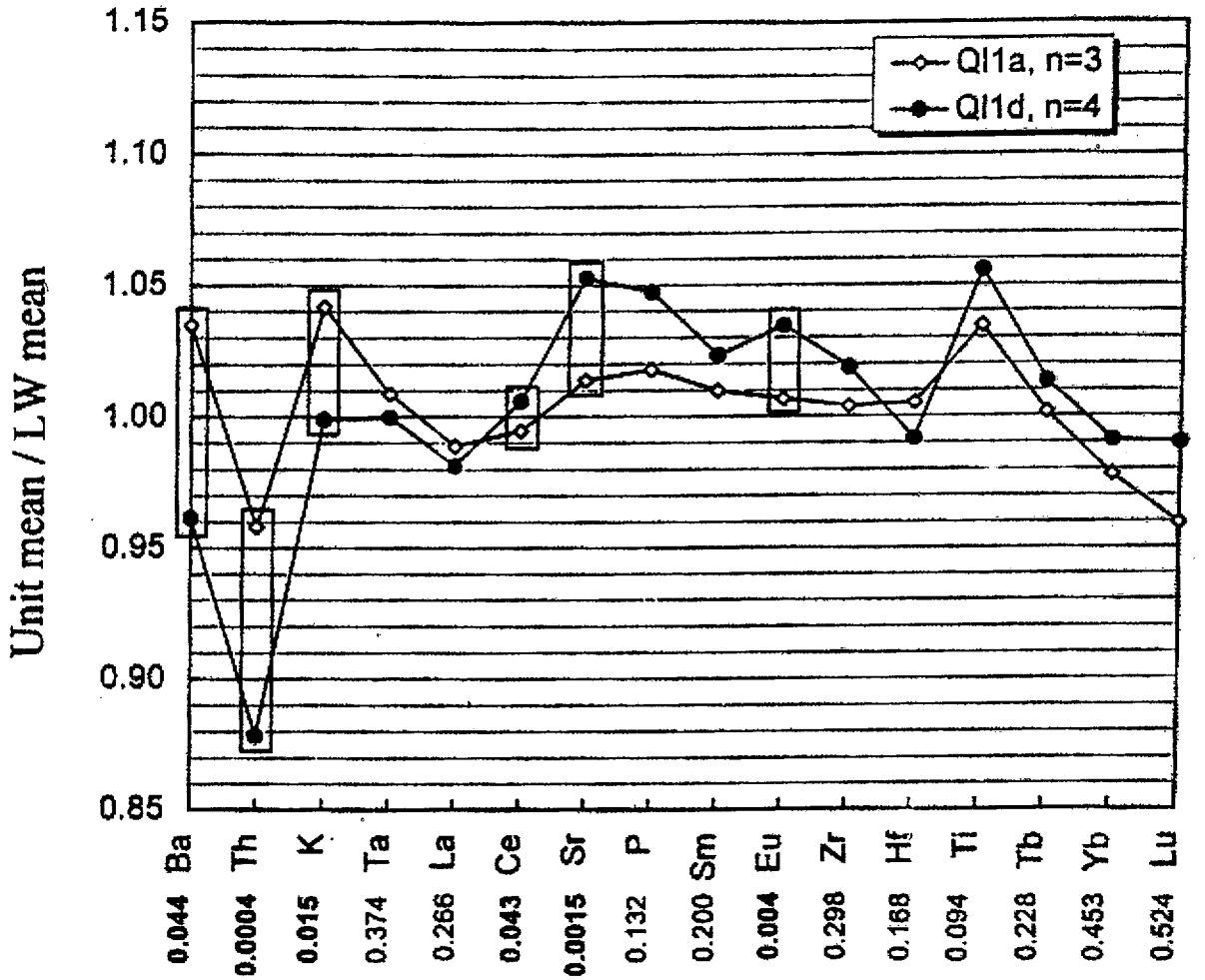

13.0
12.8
12.6
12.4
12.2
12.0
11.8
11.6
11.4
11.2
Sm
1300
1350
1400
1450
1500
Sr
Ql1a
Ql1d
Qs1u
Ql2a
Ql2b
Qs2fs
Qs3
Ql4c

Figure 42



EXAMPLE

Figure 43

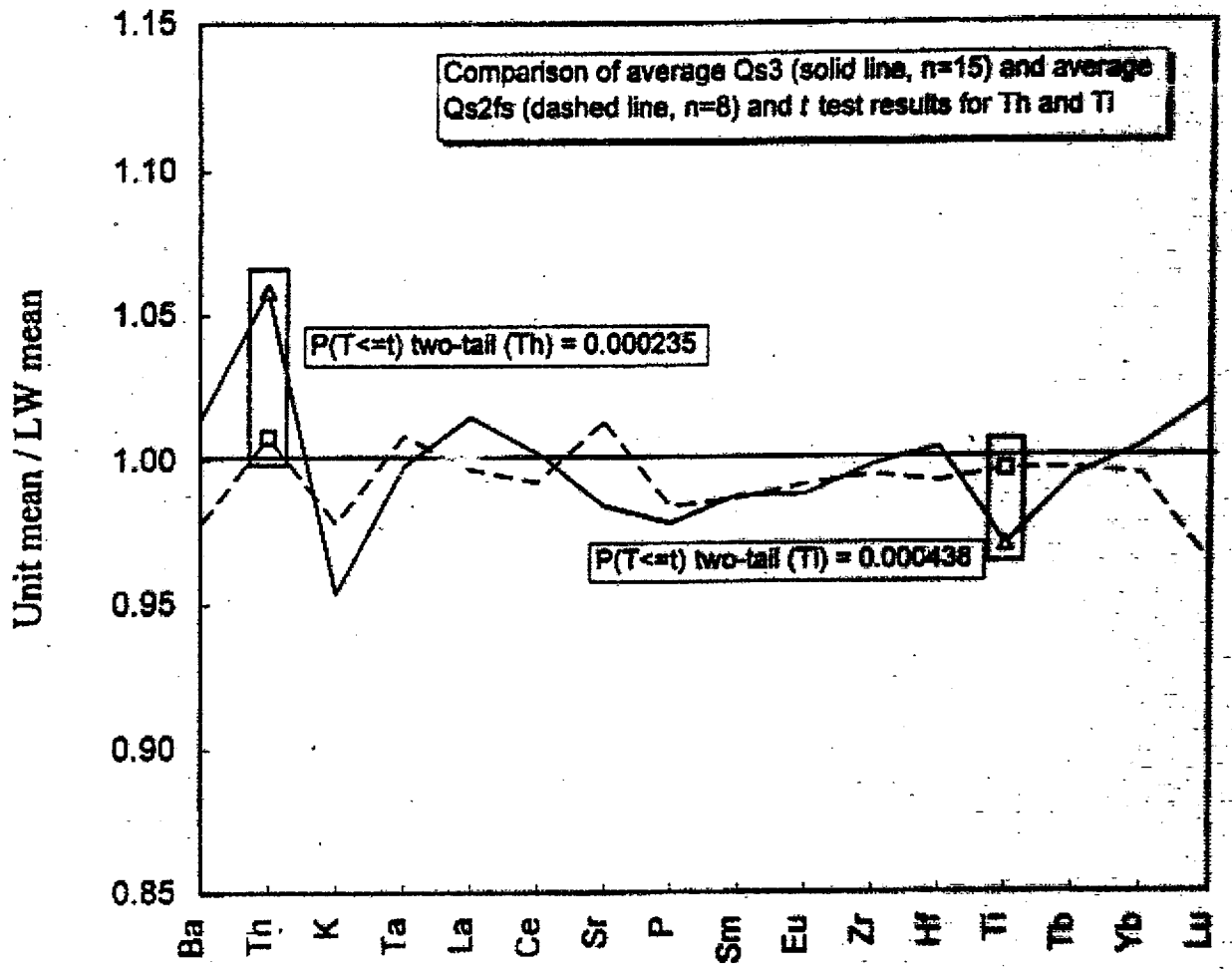
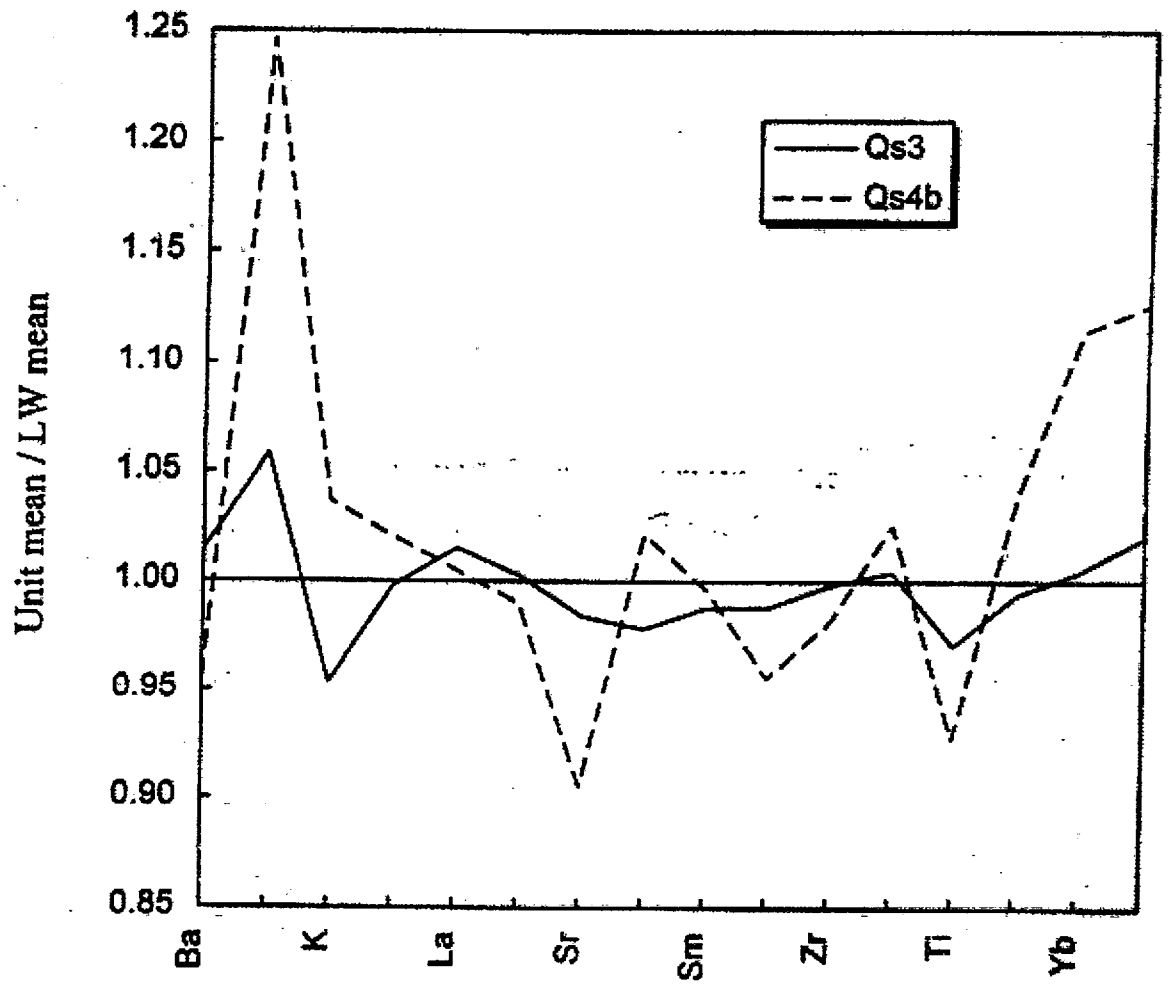

Comparison of average Qs3 (solid line, n=15) and average Qs2fs (dashed line, n=8) and t test results for Th and Ti
P(T<=t) two-tail (Th) = 0.000235
P(T<=t) two-tail (Ti) = 0.000438
Unit mean / LW mean
1.15
1.10
1.05
1.00
0.95
0.90
0.85
Ba
Th
K
Ta
La
Ce
Sr
P
Sm
Eu
Zr
Hf
Ti
Tb
Yb
Lu

Figure 44



EXAMPLE

Figure 45

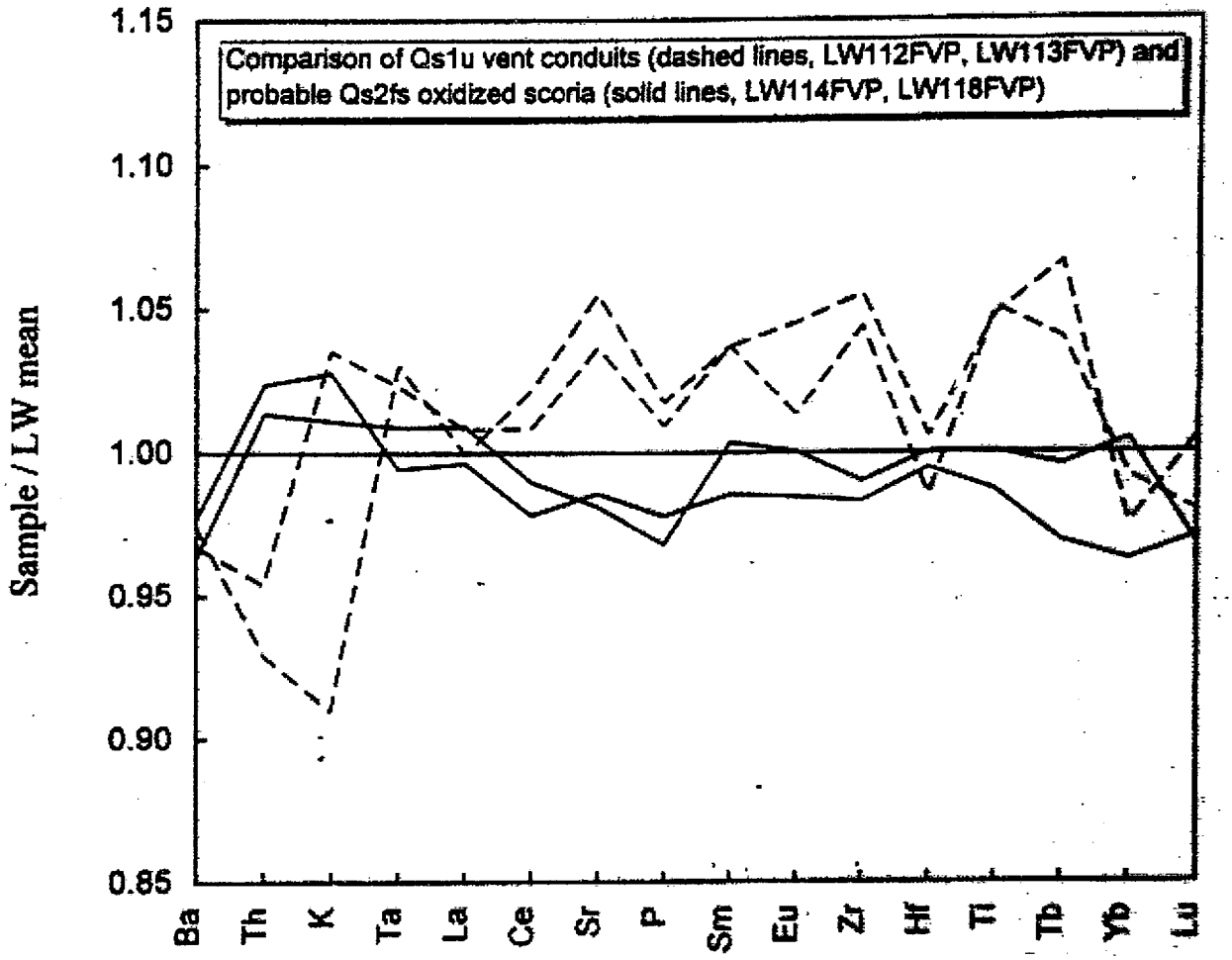
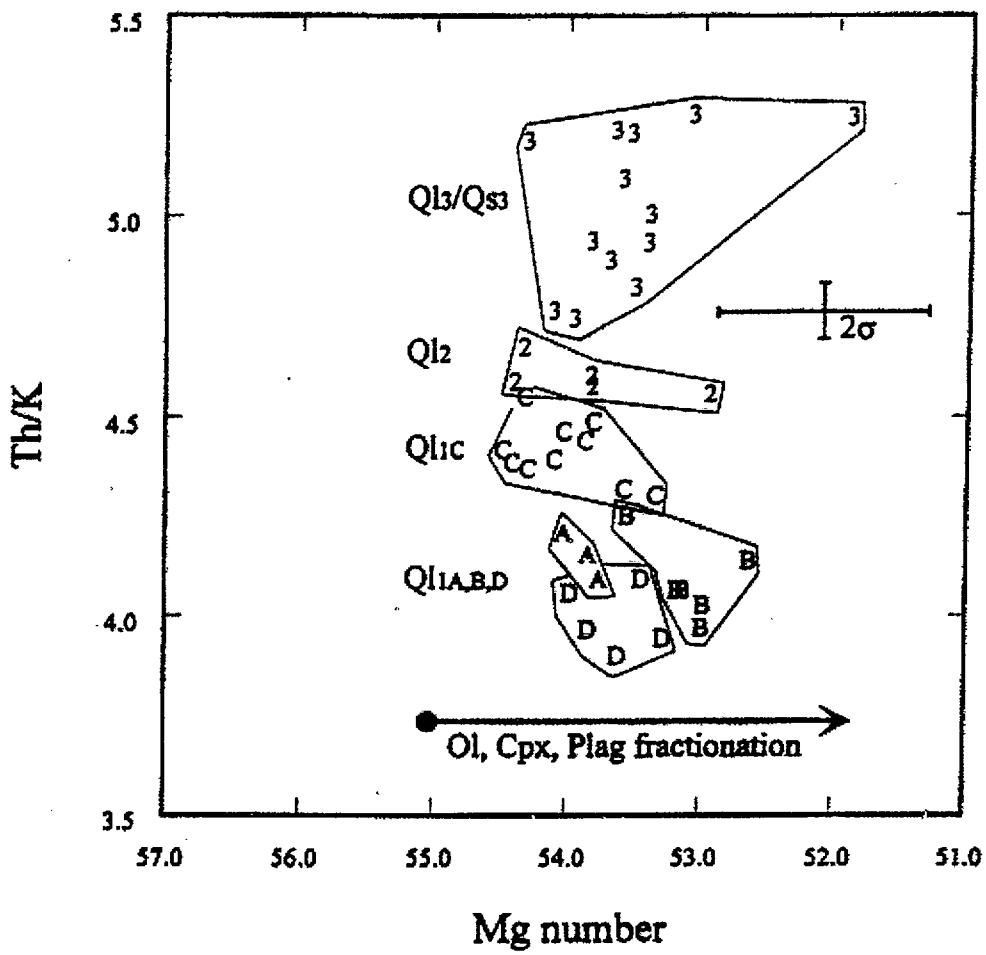

Comparison of Qs1u vent conduits (dashed lines, LW112FVP, LW113FVP) and probable Qs2fs oxidized scoria (solid lines, LW114FVP, LW118FVP)
Sample / LW mean
1.15
1.10
1.05
1.00
0.95
0.90
0.85
Ba
Th
K
Ta
La
Ce
Sr
P
Sm
Eu
Zr
Hf
Ti
Tb
Yb
Lu

Figure 46



EXAMPLE

Figure 47

Table 1. Major, trace-element (determined by XRF) and normative compositions of Lathrop Wells basalts

Sample	LW11FVP	LW12FVP	LW74FVP	LW45FVP	LW72FVP	LW73FVP	LW100FVP	LW120FVP	LW121FVP	LW101FVP	LW30FVP	LW31FVP	LW32FVP	LW63FVP
Unit	Qlla	Qlla	Qlla	Qllb	Qllb	Qllb	Qllb	Qllb	Qllb	Qslb	Qllc	Qllc	Qllc	Qllc
SiO_2	48.59	48.63	48.49	47.83	47.89	48.47	48.55	48.25	48.62	48.94	47.55	48.82	48.25	48.31
TiO_2	1.98	1.97	2.01	2.02	1.99	2.02	2.02	2.04	2.01	2.01	1.89	1.93	1.96	1.92
Al_2O_3	16.80	16.95	16.64	16.45	16.60	16.71	16.61	16.87	16.74	16.79	16.26	16.74	16.79	16.65
Fe_2O_3T	11.78	11.82	11.72	11.91	11.80	11.85	11.88	11.95	11.80	11.88	11.36	11.58	11.70	11.56
Fe_2O_3	1.77	1.77	1.76	1.79	1.77	1.78	1.78	1.79	1.77	1.78	1.70	1.74	1.75	1.73
FeO	9.01	9.04	8.97	9.11	9.03	9.07	9.09	9.14	9.03	9.09	8.69	8.86	8.95	8.84
MnO	0.18	0.17	0.17	0.18	0.17	0.18	0.18	0.18	0.18	0.18	0.17	0.17	0.17	0.18
MgO	5.89	5.93	5.93	5.81	5.72	5.88	5.80	5.80	5.88	5.77	5.84	5.82	5.75	5.92
CaO	8.29	8.41	8.55	8.42	8.66	8.48	8.68	8.46	8.59	8.43	9.36	8.54	8.50	8.45
Na_2O	3.57	3.48	3.66	3.65	3.57	3.58	3.59	3.61	3.59	3.59	3.44	3.58	3.53	3.60
K_2O	1.92	1.93	1.89	1.88	1.88	1.84	1.91	1.90	1.86	1.91	1.83	1.86	1.84	1.81
P_2O_5	1.24	1.25	1.21	1.26	1.25	1.26	1.24	1.27	1.26	1.25	1.19	1.21	1.24	1.23
Total	100.24	100.56	100.27	99.40	99.52	100.27	100.46	100.31	100.53	100.75	98.87	100.24	99.73	99.61
Mg#	53.82	53.90	54.08	53.19	53.03	53.60	53.23	53.05	53.73	53.10	54.48	53.92	53.40	54.38
V	179.1	179.5	175.9	192.1	183.0	186.9	190.6	164.7	203.5	183.8	168.4	180.5	183.7	177.9
Cr	112.8	115.0	119.4	108.7	106.4	101.0	106.6	122.9	127.0	123.2	113.7	142.2	110.0	131.0
Ni	60.0	60.7	57.4	49.1	53.1	62.2	56.5	59.0	56.3	55.0	54.8	64.0	57.4	57.2
Zn	128.9	124.9	138.3	139.5	133.6	84.1	143.2	145.7	143.8	140.8	126.9	127.4	127.7	131.0
Rb	19.4	19.9	15.7	19.8	19.7	15.3	18.7	17.2	14.1	19.8	19.7	18.7	14.6	19.1
Sr	1490	1488	1492	1530	1578	1536	1541	1540	1521	1519	1453	1467	1497	1466
Y	27.9	30.8	36.0	23.1	27.2	24.6	21.4	30.9	23.5	29.9	29.9	19.2	28.0	27.0
Zr	372.8	366.2	377.2	383.8	354.0	382.4	374.4	386.0	370.7	368.0	366.3	377.3	367.0	370.2
Nb	30.8	27.1	30.6	29.7	27.2	37.6	34.4	28.5	32.4	35.6	30.1	34.3	31.0	30.1
Ba	1373	1391	1464	1424	1354	1428	1249	1280	1309	1312	1337	1389	1435	1412
Or	11.36	11.42	11.17	11.13	11.13	10.90	11.30	11.22	10.99	11.27	10.80	10.99	10.89	10.68
Ab	29.65	29.36	28.45	27.97	27.57	29.37	28.45	28.53	29.21	30.15	25.16	29.86	29.17	29.34
An	24.26	25.02	23.52	23.06	23.84	24.17	23.67	24.32	24.18	24.16	23.61	24.24	24.65	24.03
Ne	0.29	0.07	1.34	1.57	1.40	0.52	1.04	1.10	0.63	0.13	2.15	0.21	0.36	0.62
Di	7.94	7.76	9.78	9.37	9.77	8.75	10.02	8.43	9.15	8.55	13.10	9.11	8.49	8.84
Hy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ol	16.81	16.99	16.11	16.23	15.86	16.51	15.96	16.56	16.35	16.45	14.55	16.12	16.31	16.39
Mt	2.56	2.57	2.55	2.59	2.57	2.58	2.58	2.60	2.57	2.58	2.47	2.52	2.54	2.51
Il	3.76	3.75	3.82	3.83	3.77	3.84	3.83	3.87	3.82	3.81	3.59	3.66	3.72	3.64
Ap	2.97	3.00	2.91	3.02	2.99	3.01	2.98	3.04	3.01	2.99	2.84	2.91	2.97	2.94

FeO, Fe_2O_3 and Mg# calculated assuming Fe^{II}/Fe total = 0.15. K_2O values in parentheses are from oxidized scoria that has probably been affected by alteration.

Analytical uncertainties (2 sigma) are 1% for CaO, 2% for TiO_2, Al_2O_3, Fe_2O_3, MgO, K_2O, P_2O_5 and Sr, 3% for SiO_2 and Na_2O, 4% for Ba, 8% for MnO and Zr, 10% for Cr and Zn, 13% for V, 20% for Ni, Rb, Y and Nb.

EXAMPLE

Table 1. Major, trace-element (determined by XRF) and normative compositions of Lathrop Wells basalts

LW64FVP	LW65FVP	LW66FVP	LW67FVP	LW110FVP	LW115FVP	LW93FVP	LW109FVP	LW20FVP	LW21FVP	LW22FVP	LW23FVP	LW79FVP	LW01FVP	LW71FVP
Qllc	Qllc	Qllc	Qllc	Qllc	Qllc	Qslc	Qslc	Qlld	Qlld	Qlld	Qlld	Qsld	Qslr	Qslr
48 24	48.57	48.55	48.56	49.67	49.46	49.03	48.70	48.58	46.53	47.43	47.74	48.41	48 66	48.45
1 93	1.97	1.92	1.92	1.97	1.95	1.97	1.92	2.04	1.98	2.06	2.03	2.04	1.97	2.04
16 76	16.94	16 98	16.64	17.03	17.16	16.93	16.60	16.69	16.06	16 60	16.39	16.72	16.77	16.77
11 52	11 66	11.53	11.65	11.71	11.71	11.68	11.55	12 02	11.88	12.15	12.02	12.12	11.78	11.94
1 73	1.75	1.73	1.75	1.76	1.76	1.75	1.73	1.80	1.78	1 82	1.80	1.82	1.77	1.79
8 81	8.92	8 82	8 91	8.96	8 96	8.94	8 84	9.20	9.09	9.30	9.20	9.27	9.01	9.14
0 17	0.17	0 17	0.17	0.17	0.17	0.17	0.17	0.18	0.18	0.18	0.17	0.17	0.17	0.17
5 84	5.79	5.78	6.00	5.92	5.99	5.94	5.82	6.03	5.83	6.13	5.98	5.99	5.84	5 81
8 54	8.31	8.51	8.41	8.42	8.40	8.34	8.50	8.53	9.12	8.40	8.61	8.28	8.41	8.36
3 51	3.61	3.62	3.63	3.70	3.64	3.59	3.72	3.61	3.51	3.55	3.58	3.50	3.53	3.68
1 85	1.87	1.84	1 85	1 85	1.86	1.87	1.99	1.88	1.82	1.80	1.85	1.87	1.84	1 93
1.20	1 25	1.22	1.22	1.22	1.21	1.22	1.18	1.29	1.26	1.31	1.24	1.30	1.24	1.26
99 56	100.13	100.12	100 06	101.65	101.55	100.73	100.14	100.85	98.15	99.60	99.61	100.39	100.20	100.40
54 16	53 63	53 86	54.54	54.09	54.36	54.22	53.98	53.90	53.34	54.04	53.68	53.50	53.60	53 13
183 5	178 2	178.4	177 8	182.1	193.7	173.7	180.9	173.1	180.6	184.6	185.9	176.7	186.5	184.2
124 9	109 3	103.3	124.7	121.7	120 6	119.3	113.9	103 8	119.6	106.2	109.3	123.4	115.8	113 6
54 9	54 8	51 6	59.8	52.2	47.5	51.2	58.6	61.5	61.3	61.7	66.9	66 2	52.3	59 5
128 5	137.2	131.0	134.9	137.1	131.8	142.9	137.8	132.6	130.5	123.3	135.8	134.2	133.8	135.0
18 7	16.2	19.4	17.3	20.8	19.1	18.9	18.7	14.5	18.6	14.0	14.4	18.4	17.1	17 0
1480	1500	1485	1460	1470	1483	1471	1470	1552	1533	1556	1547	1532	1516	1577
28 6	31.3	28 6	30 6	30.6	31.6	25.6	25.2	31.4	29.9	23.5	26.1	27.5	25.9	29.4
372 6	369.2	362.0	366.3	368.8	375.1	375.9	376.4	381.8	367.2	381.8	379.4	367.6	381.4	365 8
27 0	29.3	36.6	35.2	31.6	32.4	34.4	35.3	26.6	27.4	29.4	33.6	26.0	37.1	28 4
1370	1375	1368	1440	1341	1338	1325	1289	1326	1318	1315	1280	1354	1428	1306
10 95	11.03	10.88	10.93	10.96	11.02	11.04	11.77	11.10	10.73	10.64	10.93	11.06	10.86	11.40
28 78	30.04	29.34	29.39	31.28	30.81	30.37	28.22	28.93	23.82	27.58	27.15	29.59	29.88	28.84
24 61	24 63	24.75	23.77	24.50	25.08	24.68	22.83	23.89	22.81	24.15	23.28	24.51	24.59	23 63
0.50	0 26	0.71	0.70	0.00	0.00	0.00	1.75	0.88	3.17	1.32	1.71	0.00	0.00	1.26
8 87	7 66	8.55	8.95	8.37	7.89	7.89	10.30	8.99	12.47	8.13	10.10	7.38	8.20	8.67
0 00	0 00	0 00	0 00	0.21	0.07	0.41	0.00	0.00	0.00	0.00	0.00	0.55	0.58	0 00
16 20	16 61	16.22	16.58	16.50	16.91	16.52	15.68	16.84	15.16	17.43	16.36	17.04	16.21	16.48
2 51	2.54	2.51	2.53	2.55	2.55	2.54	2.51	2.61	2.58	2.64	2.61	2.64	2.56	2.60
3.66	3.75	3.65	3.65	3.73	3.70	3.74	3.65	3.88	3.77	3.91	3.86	3.87	3.74	3.87
2 88	3.00	2.92	2.93	2.92	2.90	2.92	2.82	3.09	3.00	3.13	2.96	3.12	2.96	3.01

Table 1. Major, trace-element (determined by XRF) and normative compositions of Lathrop Wells basalts

LW53FVP	LW112FVP	LW08FVPA	LW09FVP	LW10FVPA	LW33FVP	LW34FVP	LW35FVP	LW42FVP	LW43FVP	LW46FVP	LW47FVP	LW49FVP	LW50FVP	LW51FVP
Qllu	Qllu	Qslu	Qslu	Qslu	Qslu	Qslu	Qslu	Qslu	Qslu	Qslu	Qslu	Qslu	Qslu	Qslu
48.12	49.51	48.78	48.27	48.42	48.95	48.80	48.80	46.60	47.52	48.32	48.60	48.56	48.50	48.71
2.04	2.02	2.00	1.97	1.98	1.95	1.94	1.94	1.96	2.01	1.96	1.96	1.97	1.95	1.97
16.80	16.84	16.65	16.57	16.52	17.10	16.90	16.93	16.09	16.24	16.80	16.75	16.68	16.62	16.87
11.99	11.43	11.80	11.67	11.68	11.69	11.73	11.64	11.53	11.88	11.67	11.72	11.74	11.58	11.58
1.80	1.71	1.77	1.75	1.75	1.75	1.76	1.75	1.73	1.78	1.75	1.76	1.76	1.74	1.74
9.17	8.74	9.03	8.93	8.94	8.94	8.97	8.91	8.82	9.09	8.93	8.97	8.98	8.86	8.86
0.18	0.19	0.17	0.17	0.18	0.17	0.18	0.18	0.17	0.17	0.17	0.17	0.17	0.17	0.17
5.98	6.01	5.79	5.86	5.67	5.86	5.98	5.78	5.51	5.76	5.82	5.91	5.96	5.87	5.86
8.46	8.36	8.66	8.58	8.69	8.37	8.29	8.45	8.56	8.29	8.41	8.37	8.39	8.29	8.36
3.72	3.25	3.58	3.56	3.48	3.65	3.58	3.59	3.63	3.62	3.52	3.52	3.48	3.54	3.59
1.81	1.67	1.86	1.88	1.89	1.86	1.86	1.89	1.82	1.86	1.90	1.87	1.88	1.85	1.89
1.27	1.24	1.23	1.26	1.25	1.25	1.24	1.24	1.23	1.23	1.21	1.23	1.22	1.20	1.22
100.37	100.51	100.52	99.78	99.76	100.85	100.49	100.43	97.09	98.59	99.77	100.10	100.04	99.56	100.22
53.75	55.06	53.34	53.91	53.09	53.85	54.30	53.65	52.69	53.04	53.76	54.00	54.18	54.13	54.09
182.7	208.9	184.6	179.6	177.0	185.7	188.0	185.0	176.9	174.0	167.4	190.1	180.3	179.1	171.3
110.6	112.1	121.5	117.1	116.2	120.3	132.0	121.3	107.3	98.9	115.6	123.9	113.4	120.1	118.6
69.1	56.3	58.9	57.0	51.3	53.0	54.8	52.6	53.8	54.1	53.8	56.0	62.2	56.7	57.2
113.0	157.9	142.4	136.0	142.1	120.6	122.1	125.7	148.9	139.5	136.2	107.6	141.1	137.1	139.7
14.4	17.1	19.5	18.9	18.1	12.4	16.8	19.5	13.8	17.2	17.5	17.4	18.6	18.0	21.0
1572	1550	1525	1522	1541	1455	1460	1481	1510	1509	1470	1485	1478	1474	1502
25.9	24.1	26.9	35.6	27.2	33.2	25.6	22.8	22.4	24.8	29.8	29.0	22.8	16.5	26.5
364.7	386.9	363.4	382.0	369.9	365.7	360.7	365.8	377.3	387.4	391.9	370.0	373.8	369.9	357.7
30.3	34.2	29.7	27.7	31.2	28.5	30.5	37.8	28.0	23.2	33.2	30.6	32.7	30.8	33.5
1399	1326	1292	1378	1272	1391	1401	1378	1353	1354	1418	1408	1411	1444	1396
10.72	9.89	11.00	11.11	11.16	10.97	11.00	11.18	10.76	11.02	11.21	11.05	11.10	10.94	11.20
28.23	27.46	29.40	28.60	29.07	30.31	30.30	29.87	26.13	28.07	29.03	29.79	29.48	29.91	29.83
23.90	26.56	23.96	23.81	23.96	24.88	24.65	24.61	22.35	22.68	24.56	24.49	24.44	24.12	24.43
1.76	0.00	0.49	0.80	0.22	0.33	0.01	0.26	2.46	1.36	0.40	0.00	0.00	0.00	0.30
8.83	6.38	9.77	9.45	9.74	7.72	7.64	8.29	10.69	9.33	8.33	8.16	8.32	8.24	8.21
0.00	11.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.41	0.50	0.00
16.79	8.63	15.97	16.12	15.68	16.77	17.09	16.41	14.92	16.12	16.46	16.58	16.47	16.12	16.47
2.61	2.48	2.57	2.54	2.54	2.54	2.55	2.53	2.51	2.58	2.54	2.55	2.55	2.52	2.52
3.87	3.83	3.79	3.73	3.76	3.71	3.67	3.68	3.72	3.82	3.72	3.71	3.73	3.71	3.74
3.04	2.96	2.95	3.01	3.00	2.99	2.97	2.97	2.95	2.95	2.90	2.95	2.92	2.89	2.92

EXAMPLE

Table 1. Major, trace-element (determined by XRF) and normative compositions of Lathrop Wells basalts

LW52FVP	LW98FVP	LW99FVP	LW103FVP	LW113FVP	LW116FVP	LW117FVP	LW06FVP	LW07FVP	LW40FVP	LW41FVP	LW55FVP	LW56FVP	LW19FVP	LW25FVP
Qs1u	Qs1u	Qs1u	Qs1u	Qs1u	Qs1u	Qs1u	Ql2a	Ql2a	Ql2a	Ql2a	Ql2a	Ql2a	Ql2a	Ql2b
48.60	48.94	48.89	48.91	49.02	48.37	47.92	48.58	48.89	49.74	48.78	48.71	48.30	48.96	48.26
1.95	1.97	1.99	1.97	2.01	1.98	1.97	1.90	1.89	1.89	1.89	1.84	1.90	1.86	1.93
16.75	16.84	16.92	16.60	16.96	16.81	16.49	16.92	17.10	17.06	16.87	16.76	16.65	16.69	16.96
11.73	11.75	11.81	11.84	11.88	11.81	11.57	11.45	11.50	11.38	11.48	11.43	11.56	11.40	11.90
1.76	1.76	1.77	1.78	1.78	1.77	1.74	1.72	1.72	1.71	1.72	1.71	1.73	1.71	1.78
8.97	8.99	9.04	9.06	9.09	9.04	8.85	8.76	8.80	8.71	8.78	8.74	8.84	8.72	9.10
0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.18	0.18
5.91	5.78	5.94	5.93	5.87	5.75	5.69	5.86	5.76	5.50	5.75	5.79	5.88	5.79	5.81
8.31	8.47	8.66	8.29	8.32	8.28	9.11	8.50	8.55	8.74	8.48	8.66	8.77	8.61	8.38
3.51	3.57	3.52	3.44	3.60	3.78	3.37	3.52	3.44	3.61	3.56	3.38	3.52	3.43	3.54
1.94	1.92	1.89	1.94	1.90	(2.12)	1.77	1.78	1.83	1.87	1.82	1.86	1.84	1.79	1.86
1.22	1.23	1.25	1.22	1.23	1.25	1.21	1.21	1.23	1.21	1.23	1.20	1.18	1.25	1.23
100.09	100.63	101.05	100.31	100.96	100.31	99.26	99.90	100.36	101.18	100.03	99.80	99.77	99.94	100.03
53.98	53.39	53.96	53.83	53.53	53.14	53.38	54.37	53.86	52.97	53.85	54.13	54.24	54.18	53.19
186.3	193.1	177.7	173.1	160.3	170.8	172.3	181.1	168.9	179.7	184.2	177.1	173.9	176.7	175.3
136.9	102.6	121.5	109.8	123.8	119.7	150.6	128.7	109.1	93.3	106.4	112.8	110.8	99.5	116.4
59.2	57.7	58.5	57.5	54.3	57.5	55.2	51.8	50.1	40.5	48.4	46.6	54.0	56.5	63.3
130.6	138.7	147.2	138.0	130.4	132.6	138.5	124.2	128.3	141.6	133.4	128.9	126.0	127.0	127.3
17.1	19.4	17.9	20.5	17.2	18.7	15.8	17.2	17.5	19.6	17.2	22.9	18.6	18.7	18.3
1481	1512	1514	1498	1523	1529	1530	1418	1444	1451	1447	1438	1449	1451	1456
31.8	29.8	35.4	27.3	27.5	28.5	35.6	25.0	24.1	22.7	30.0	27.1	29.1	24.7	32.4
373.0	376.6	384.7	377.6	391.0	369.4	373.5	375.1	362.9	367.7	374.3	366.3	367.6	382.4	378.7
28.0	32.4	32.6	26.1	31.3	33.0	30.2	25.6	29.4	31.7	25.6	27.2	28.6	30.8	39.4
1464	1290	1317	1328	1318	1248	1256	1384	1413	1359	1374	1374	1407	1393	1450
11.46	11.36	11.19	11.46	11.25	(12.53)	10.47	10.52	10.83	11.07	10.74	11.01	10.90	10.57	10.97
29.55	29.90	29.21	29.12	30.36	(27.27)	27.62	29.80	29.06	30.53	30.10	28.62	27.98	28.99	29.07
24.34	24.37	24.87	24.23	24.63	(22.73)	24.73	25.21	25.94	24.93	24.81	25.15	24.27	24.99	25.02
0.07	0.15	0.32	0.00	0.03	(2.56)	0.49	0.00	0.00	0.00	0.00	0.00	0.99	0.00	0.48
8.11	8.66	8.94	8.09	7.84	(9.11)	11.05	8.16	7.70	9.39	8.37	8.97	10.21	8.61	7.77
0.00	0.00	0.00	2.44	0.00	(0.00)	0.00	0.56	2.58	1.42	0.62	1.92	0.00	3.84	0.00
16.76	16.33	16.55	15.09	16.86	(16.15)	15.13	16.03	14.60	14.26	15.76	14.67	15.85	13.34	16.89
2.55	2.55	2.57	2.57	2.58	(2.57)	2.52	2.49	2.50	2.47	2.50	2.48	2.51	2.48	2.59
3.71	3.74	3.78	3.75	3.82	(3.77)	3.74	3.61	3.60	3.39	3.59	3.50	3.61	3.54	3.67
2.92	2.93	2.98	2.92	2.93	(2.98)	2.90	2.91	2.94	2.90	2.93	2.86	2.82	2.98	2.94

Table 1. Major, trace-element (determined by XRF) and normative compositions of Lathrop Wells basalts

LW26FVP	LW27FVP	LW28FVP	LW29FVP	LW04FVPA	LW54FVP	LW57FVP	LW58FVP	LW39FVP	LW48FVP	LW44FVP	LW96FVP	LW97FVP	LW104FVP	LW119FVP
Ql2b	Ql2b	Ql2b	Ql2b	Ql2c	Ql2c	Ql2c	Ql2c	Ql2u	Ql2u	Qs2u	Qs2fs	Qs2fs	Qs2fs	Qs2fs
48.26	48.87	48.62	48.66	49.04	48.41	48.79	48.53	48.20	48.28	47.49	48.84	49.32	49.30	49.22
1.93	1.96	1.86	1.97	1.85	1.87	1.85	1.91	1.91	1.91	1.88	1.93	1.91	1.94	1.87
16.68	16.78	16.74	16.73	16.73	16.77	16.80	16.39	16.68	16.67	16.23	16.71	16.80	16.91	16.87
11.56	11.74	11.40	11.72	11.47	11.40	11.55	11.39	11.46	11.39	11.43	11.63	11.76	11.61	11.53
1.73	1.76	1.71	1.76	1.72	1.71	1.73	1.71	1.72	1.71	1.71	1.74	1.76	1.74	1.73
8.84	8.98	8.72	8.97	8.78	8.72	8.84	8.71	8.77	8.71	8.74	8.90	9.00	8.88	8.82
0.17	0.17	0.17	0.17	0.17	0.17	0.18	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
5.83	5.88	5.86	5.89	5.75	5.78	5.68	5.84	5.88	5.85	5.86	5.92	6.13	5.85	5.90
8.62	8.51	8.67	8.38	8.94	8.72	8.92	8.80	8.41	8.64	8.36	8.56	8.38	8.33	8.70
3.47	3.60	3.44	3.61	3.40	3.44	3.47	3.55	3.60	3.53	3.42	3.48	3.32	3.37	3.32
1.80	1.85	1.81	1.83	1.83	1.78	1.76	1.79	1.86	1.86	1.80	1.82	1.83	1.79	1.79
1.19	1.21	1.21	1.22	1.21	1.18	1.23	1.20	1.18	1.20	1.17	1.27	1.22	1.19	1.23
99.50	100.57	99.77	100.18	100.40	99.52	100.22	99.56	99.35	99.50	97.81	100.32	100.84	100.46	100.59
54.01	53.84	54.47	53.91	53.88	54.15	53.40	54.43	54.45	54.46	54.44	54.26	54.85	53.99	54.36
182.0	172.4	181.8	172.1	179.5	175.2	177.4	169.5	170.6	186.1	180.7	179.7	178.8	181.1	177.0
127.5	113.0	110.0	115.6	112.4	94.4	103.7	104.6	109.8	124.2	117.5	110.5	126.5	118.2	104.1
60.2	58.3	49.4	53.6	50.4	42.9	49.9	50.8	56.8	53.0	53.7	51.2	54.1	57.5	49.9
125.4	128.3	126.8	119.4	135.9	129.9	115.8	129.6	127.1	133.2	135.1	135.5	141.7	129.6	135.6
18.6	15.8	17.0	18.3	20.3	21.0	19.8	17.6	20.8	18.2	17.7	20.0	17.5	19.7	19.1
1453	1489	1426	1496	1454	1450	1423	1486	1455	1467	1394	1454	1465	1479	1429
24.3	25.0	27.9	31.9	28.0	30.6	23.7	29.8	21.9	27.2	30.9	26.4	32.4	32.8	26.8
386.4	377.5	367.0	372.1	374.7	379.1	370.7	368.7	366.9	379.3	369.9	368.7	358.7	366.4	368.5
25.2	32.0	32.9	33.4	32.4	22.7	27.5	29.1	30.7	23.9	25.5	33.0	33.8	34.5	31.6
1403	1399	1395	1392	1322	1377	1410	1312	1455	1435	1391	1373	1308	1329	1353
10.66	10.92	10.72	10.84	10.84	10.53	10.40	10.57	10.98	11.02	10.64	10.78	10.79	10.58	10.56
29.02	29.88	29.07	30.01	28.77	29.12	29.36	29.14	28.70	28.49	28.67	29.45	28.07	28.51	28.06
24.73	24.26	25.00	24.12	25.07	25.15	25.17	23.61	23.96	24.26	23.74	24.69	25.66	25.84	25.97
0.17	0.33	0.00	0.30	0.00	0.00	0.00	0.47	0.97	0.72	0.12	0.00	0.00	0.00	0.00
9.20	8.98	9.05	8.53	10.10	9.28	9.85	10.79	9.03	9.58	9.00	8.53	7.23	7.07	8.24
0.00	0.00	1.11	0.00	1.75	0.30	0.65	0.00	0.00	0.00	0.00	1.74	6.64	6.92	5.73
16.09	16.38	15.31	16.54	14.35	15.68	15.22	15.40	16.17	15.84	16.16	15.29	12.68	11.85	12.41
2.51	2.55	2.48	2.55	2.49	2.48	2.51	2.48	2.49	2.48	2.48	2.53	2.56	2.52	2.51
3.66	3.73	3.53	3.74	3.52	3.55	3.51	3.62	3.63	3.63	3.57	3.66	3.63	3.68	3.54
2.84	2.91	2.89	2.93	2.89	2.82	2.94	2.86	2.82	2.88	2.81	3.03	2.92	2.86	2.95

EXAMPLE

Table 1. Major, trace-element (determined by XRF) and normative compositions of Lathrop Wells basalts

LW126FVP	LW130FVP	LW132FVP	LW135FVP	LW114FVP	LW118FVP	LW127FVP	LW128FVP	LW36FVP	LW37FVP	LW38FVP	LW05FVPA	LW59FVP	LW60FVP
Qs2fs	Qs2fs	Qs2fs	Qs2fs	Qs2fs	Qs2fs	Qs2fs	Qs2fs	Qs2u	Qs2u	Qs2u	Ql3	Ql3	Ql3
49.01	49.04	49.46	49.22	48.87	49.50	49.17	49.12	48.61	48.82	48.77	49.31	49.03	48.88
1.92	1.93	1.89	1.94	1.92	1.90	1.95	1.94	1.92	1.91	1.94	1.91	1.86	1.84
17.02	16.95	16.91	16.80	17.00	17.18	17.02	16.87	16.89	16.60	16.45	16.76	16.95	16.75
11.76	11.82	11.66	11.54	11.62	11.48	11.74	11.58	11.63	11.63	11.69	11.59	11.42	11.37
1.76	1.77	1.75	1.73	1.74	1.72	1.	1.74	1.74	1.74	1.75	1.74	1.71	1.71
9.00	9.04	8.92	8.83	8.89	8.78	8.98	8.86	8.90	8.90	8.94	8.87	8.74	8.70
0.17	0.17	0.17	0.17	0.17	0.17	0.18	0.17	0.18	0.17	0.17	0.17	0.18	0.17
5.75	5.87	5.89	5.78	5.94	5.81	5.99	5.74	5.81	5.84	5.86	5.95	5.60	5.76
8.40	8.39	8.46	8.26	8.39	8.54	8.14	8.12	8.45	8.34	8.32	8.84	8.64	8.74
3.04	3.27	3.28	3.27	3.45	3.45	3.46	3.60	3.43	3.48	3.58	3.53	3.43	3.41
1.71	1.73	1.82	1.89	1.86	1.89	1.89	(2.24)	1.88	1.89	1.94	1.83	1.88	1.84
1.14	1.16	1.19	1.15	1.18	1.19	1.19	1.19	1.23	1.19	1.21	1.19	1.23	1.17
99.93	100.33	100.74	100.01	100.39	101.10	100.71	100.56	100.03	99.87	99.91	101.07	100.22	99.93
53.23	53.62	54.07	53.84	54.35	54.09	54.29	53.59	53.80	53.93	53.86	54.46	53.30	54.15
175.9	179.0	179.3	166.9	175.5	183.3	178.8	180.9	178.0	186.7	186.5	181.6	185.6	182.0
106.4	116.6	113.2	130.8	122.1	109.5	110.0	111.7	132.8	123.7	134.8	112.5	86.8	95.0
50.4	53.9	53.4	48.6	47.5	47.0	58.0	58.3	54.6	57.4	55.9	52.3	46.8	44.8
141.6	137.5	141.2	136.2	134.1	136.8	140.5	138.4	124.9	126.5	124.5	127.8	130.9	139.3
16.7	19.8	22.8	19.9	19.0	21.6	21.1	26.1	18.9	19.9	19.7	20.9	18.0	19.3
1616	1528	1464	1476	1442	1449	1482	1469	1447	1456	1484	1486	1425	1448
33.7	28.5	30.5	28.1	25.8	29.3	30.6	26.2	21.3	26.1	28.5	26.2	29.4	21.5
377.6	377.2	364.9	367.9	366.9	364.4	387.5	371.5	368.0	371.0	365.3	356.4	377.6	360.4
33.7	37.0	32.5	36.9	33.6	28.8	28.1	27.1	34.2	33.9	32.2	26.8	32.0	31.0
1307	1268	1340	1376	1312	1331	1343	1353	1388	1406	1433	1280	1426	1395
10.14	10.20	10.79	11.18	10.98	11.17	11.17	(13.24)	11.11	11.16	11.50	10.80	11.12	10.86
25.72	27.69	27.77	27.62	29.15	29.18	29.25	(28.94)	29.01	29.44	29.87	29.88	29.05	28.83
27.85	26.57	26.13	25.78	25.54	25.93	25.46	(23.38)	25.25	24.21	23.19	24.58	25.39	25.09
0.00	0.00	0.00	0.00	0.00	0.00	0.00	(0.81)	0.00	0.00	0.22	0.00	0.00	0.00
6.00	6.88	7.34	7.14	7.62	7.88	6.57	(8.24)	7.84	8.46	9.14	10.16	8.50	9.46
12.55	7.79	7.82	7.84	2.08	3.39	3.93	(0.00)	1.62	1.86	0.00	0.06	2.63	1.92
8.09	11.53	11.28	10.97	15.39	14.00	14.59	(16.29)	15.45	15.11	16.28	15.97	13.95	14.40
2.56	2.57	2.54	2.51	2.53	2.50	2.55	(2.52)	2.53	2.53	2.54	2.52	2.48	2.47
3.65	3.66	3.59	3.67	3.65	3.60	3.70	(3.68)	3.65	3.62	3.67	3.62	3.53	3.50
2.74	2.79	2.85	2.75	2.81	2.84	2.86	(2.85)	2.94	2.86	2.89	2.85	2.95	2.81

Table 1. Major, trace-element (determined by XRF) and normative compositions of Lathrop Wells basalts

LW61FVP	LW62FVP	LW02FVP	LW03FVP	LW68FVP	LW69FVP	LW70FVP	LW75FVP	LW76FVP	LW80FVP	LW81FVP	LW82FVP-B	LW82FVP-R	LW86FVP	LW87FVP
Ql3	Ql3	Qs3	Qs3	Qs3	Qs3	Qs3	Qs3	Qs3	Qs3	Qs3	Qs3	Qs3	Qs3	Qs3
48.65	48.19	48.55	48.68	48.62	49.02	48.74	48.67	48.46	48.50	48.78	49.09	48.04	49.62	49.33
1.83	1.82	1.83	1.83	1.90	1.87	1.87	1.90	1.89	1.91	1.85	1.83	1.85	1.86	1.86
16.87	16.87	16.96	16.87	16.86	16.96	16.81	16.86	16.94	16.73	16.84	16.91	16.51	17.08	16.95
11.45	11.22	11.25	11.50	11.45	11.43	11.40	11.57	11.66	11.48	11.52	11.34	11.43	11.49	11.50
1.72	1.68	1.69	1.72	1.72	1.71	1.71	1.74	1.75	1.72	1.73	1.70	1.71	1.72	1.72
8.76	8.58	8.61	8.80	8.76	8.74	8.72	8.85	8.92	8.78	8.81	8.68	8.74	8.79	8.80
0.18	0.17	0.17	0.18	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
5.70	5.62	5.22	5.67	5.90	5.69	5.77	5.72	5.74	5.78	5.88	5.64	5.65	5.69	5.59
8.79	8.93	8.83	8.52	8.59	8.65	8.70	8.20	8.30	8.62	8.57	8.59	8.67	8.81	8.94
3.39	3.31	3.47	3.35	3.50	3.43	3.44	3.22	2.99	3.47	3.39	3.28	3.50	3.09	3.19
1.80	1.81	1.77	1.76	1.84	1.78	1.80	1.76	1.72	1.76	1.71	1.75	(1.43)	1.72	1.73
1.17	1.19	1.21	1.18	1.21	1.19	1.19	1.17	1.12	1.20	1.19	1.18	1.39	1.21	1.21
99.82	99.15	99.25	99.53	100.04	100.19	99.89	99.24	98.99	99.62	99.90	99.77	98.45	100.74	100.47
53.72	53.87	51.93	53.44	54.54	53.69	54.11	53.54	53.43	53.99	54.34	53.69	53.53	53.57	53.12
187.6	175.5	181.4	178.4	179.9	180.2	181.1	181.3	164.0	168.4	174.7	181.0	172.8	182.4	187.5
110.3	108.3	63.1	107.3	111.7	105.0	105.3	106.6	96.9	107.4	106.9	84.0	111.5	102.8	97.9
46.9	47.4	32.5	42.2	45.3	45.3	48.1	55.0	58.1	50.2	49.9	45.3	54.3	48.0	40.7
137.6	131.8	124.9	132.1	133.9	133.0	128.2	115.9	135.0	141.3	138.0	124.0	133.3	134.2	136.5
19.8	23.9	21.7	18.3	19.5	20.2	19.7	20.8	19.9	20.3	20.1	18.2	14.5	20.5	17.9
1450	1443	1470	1431	1480	1430	1440	1444	1476	1450	1412	1439	1426	1460	1449
22.6	22.2	34.2	28.8	26.1	26.5	25.9	26.7	23.9	18.3	22.3	26.5	25.2	29.9	27.9
370.5	368.1	370.8	372.5	372.4	371.8	363.9	370.8	372.0	366.6	367.6	379.8	371.3	363.6	371.0
36.6	27.1	26.9	29.9	31.0	29.9	30.1	35.5	32.4	36.5	30.6	30.1	31.5	32.6	33.1
1376	1385	1433	1419	1361	1410	1404	1412	1362	1426	1417	1429	1406	1334	1357
10.63	10.72	10.45	10.42	10.90	10.53	10.66	10.40	10.15	10.41	10.13	10.32	(8.45)	10.16	10.25
28.65	28.03	29.39	28.31	29.41	29.03	29.08	27.24	25.27	29.32	28.68	27.77	(29.62)	26.16	27.02
25.63	25.91	25.57	25.92	24.94	25.73	25.22	26.48	27.87	25.00	25.78	26.37	(25.22)	27.76	26.90
0.00	0.00	0.00	0.00	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	(0.00)	0.00	0.00
9.21	9.47	9.29	7.89	8.77	8.51	9.12	6.13	5.67	8.89	8.10	7.77	(8.96)	7.33	8.59
1.63	0.89	1.38	4.67	0.00	3.28	1.49	8.99	12.15	1.21	4.07	7.53	(3.37)	12.20	8.48
14.69	14.77	13.78	12.91	16.29	13.64	14.84	10.47	8.44	15.18	13.66	10.66	(13.36)	7.59	9.70
2.49	2.44	2.45	2.50	2.49	2.48	2.48	2.52	2.54	2.50	2.51	2.47	(2.48)	2.50	2.50
3.48	3.46	3.48	3.48	3.61	3.54	3.55	3.60	3.59	3.62	3.51	3.48	(3.52)	3.53	3.53
2.81	2.85	2.89	2.81	2.89	2.84	2.84	2.80	2.69	2.88	2.84	2.82	(2.86)	2.90	2.89

EXAMPLE

Table 1. Major, trace-element (determined by XRF) and normative compositions of Lathrop Wells basalts

LW88FVP	LW95FVP	LW123FVP	LW133FVP-B	LW133FVP-R	LW78FVP-B	LW78FVP-R	LW124FVP-B	LW124FVP-R	LW134FVP	LW15FVP	LW16FVP	LW14FVP
Qs3	Qs3	Qs3	Qs4a	Qs4a	Qs4b	Qs4b	Qs4b	Qs4b	Qs4b	Qs4c	Qs4c	?
49.43	48.98	49.04	49.36	48.90	49.77	49.34	50.37	49.46	50.11	48.20	48.65	49.13
1.85	1.90	1.89	1.87	1.82	1.75	1.75	1.79	1.81	1.81	1.81	1.80	1.88
16.84	17.08	16.79	16.70	16.45	16.63	16.68	16.88	16.85	16.79	16.07	16.24	16.82
11.50	11.80	11.60	11.81	11.90	10.87	10.98	11.09	11.21	11.21	12.05	12.13	11.61
1.72	1.77	1.74	1.77	1.78	1.63	1.65	1.66	1.68	1.68	1.81	1.82	1.74
8.80	9.03	8.87	9.04	9.10	8.32	8.40	8.48	8.58	8.58	9.22	9.28	8.88
0.17	0.18	0.18	0.18	0.17	0.17	0.17	0.16	0.18	0.19	0.18	0.18	0.17
5.71	5.86	5.99	6.21	6.32	5.63	5.36	5.62	5.13	5.70	7.09	7.14	5.71
8.86	8.66	8.44	8.57	8.43	8.40	8.29	8.08	8.11	7.98	8.20	8.18	7.98
3.32	3.15	3.52	3.20	3.49	3.05	3.13	3.47	3.66	3.08	3.18	3.17	3.06
1.77	(1.48)	(1.61)	1.79	(1.74)	1.91	(1.77)	1.87	(1.55)	1.93	1.64	1.63	1.67
1.20	1.24	1.16	1.20	1.18	1.18	1.33	1.17	1.26	1.26	1.17	1.18	1.07
100.64	100.32	100.21	100.89	100.40	99.37	98.81	100.51	99.21	100.04	99.57	100.30	99.09
53.63	53.66	54.61	55.07	55.30	54.70	53.23	54.16	51.60	54.23	57.80	57.82	53.41
193.1	181.0	174.4	167.9	181.4	164.1	160.4	165.9	169.1	163.5	171.7	169.4	161.5
105.2	106.3	113.0	297.0	406.1	103.2	102.2	110.3	106.9	128.0	187.0	193.0	106.2
49.4	46.4	55.9	62.5	76.8	53.0	47.8	48.8	39.4	52.0	110.4	106.5	57.8
127.7	142.0	133.5	137.9	144.1	134.5	145.9	134.3	184.0	140.5	94.3	99.0	100.8
18.7	19.0	22.6	20.6	17.9	30.7	32.5	30.8	28.6	32.6	16.8	15.8	16.5
1449	1498	1420	1432	1427	1317	1318	1334	1349	1334	1372	1380	1414
25.2	30.8	24.3	25.4	26.7	32.0	32.0	30.5	27.6	28.1	17.6	25.4	32.0
367.4	374.0	366.3	362.2	360.2	361.0	363.1	357.9	364.2	372.2	352.3	357.1	368.2
33.4	27.7	36.4	31.8	32.0	31.4	32.8	33.2	38.7	30.8	31.0	26.6	29.9
1284	1324	1301	1344	1259	1330	1292	1347	1282	1251	1334	1317	1383
10.47	(8.73)	(9.53)	10.59	(10.26)	11.32	(10.48)	11.08	(9.17)	11.40	9.68	9.62	9.86
28.06	(26.62)	(29.76)	27.09	(29.53)	25.76	(26.46)	29.35	(30.92)	26.03	26.87	26.85	25.90
25.94	(28.24)	(25.37)	26.01	(24.19)	26.16	(26.35)	25.06	(25.09)	26.42	24.86	25.37	27.35
0.00	(0.00)	(0.00)	0.00	(0.00)	0.00	(0.00)	0.00	(0.00)	0.00	0.00	0.00	0.00
9.10	(6.23)	(8.04)	7.86	(8.88)	7.10	(5.67)	6.76	(6.39)	4.71	7.41	6.84	5.04
6.09	(12.16)	(4.11)	7.98	(1.78)	14.51	(15.66)	10.27	(9.28)	17.51	6.05	7.72	15.65
11.49	(8.57)	(13.86)	11.72	(16.21)	5.42	(4.71)	8.78	(8.85)	4.47	15.17	14.34	6.02
2.50	(2.57)	(2.52)	2.57	(2.59)	2.36	(2.39)	2.41	(2.44)	2.44	2.62	2.64	2.52
3.50	(3.61)	(3.59)	3.56	(3.46)	3.33	(3.32)	3.40	(3.44)	3.43	3.44	3.42	3.56
2.87	(2.96)	(2.78)	2.86	(2.82)	2.83	(3.19)	2.80	(3.01)	3.02	2.80	2.83	2.56

Table 1. Major, trace-element (determined by XRF) and normative compositions of Lathrop Wells basalts

LW129FVP	LW131FVP-B
?	?
49.06	49.13
2.02	1.84
16.79	16.79
11.93	11.40
1.79	1.71
9.13	8.72
0.18	0.18
5.89	5.73
7.84	8.41
3.32	3.47
1.96	1.86
1.21	1.23
100.19	100.05
53.49	53.95
180.9	181.2
108.2	107.2
51.5	47.6
138.7	136.2
19.6	22.8
1503	1398
25.7	27.5
382.0	369.6
37.3	27.7
1298	1320
11.58	11.03
28.11	29.36
25.23	24.83
0.00	0.00
5.45	8.01
7.65	3.68
12.20	13.61
2.59	2.48
3.83	3.50
2.90	2.94

EXAMPLE

Table 2. Trace-element compositions of Lathrop Wells basalts determined by INAA

Sample	LW11FVP	LW12FVP	LW74FVP	LW45FVP	LW72FVP	LW73FVP	LW100FVP	LW101FVP	LW30FVP
Unit	Ql1a	Ql1a	Ql1a	Ql1b	Ql1b	Ql1b	Ql1b	Qs1b	Ql1c
Rb	20	21	22	21	18	19	19	20	22
Sc	18.8	18.9	18.87	19.1	18.7	19	19.04	18.7	18.8
Co	30.8	31.1	30.6	31	30.5	30.5	30.7	30.4	29.8
Sr	1430	1440	1420	1480	1400	1460	1470	1460	1470
Ba	1410	1420	1430	1380	1370	1430	1430	1420	1410
La	92.1	92.3	92.5	94.2	92.7	93.7	94.4	92.2	90.5
Ce	180	181	181	185	183	186.5	185.8	181.6	177
Nd	72	74	80	78	72	80	84	76	72
Sm	12.5	12.2	12.38	12.6	12.6	12.67	12.86	12.51	11.9
Eu	3.19	3.17	3.15	3.28	3.29	3.27	3.32	3.18	3.07
Tb	1.15	1.13	1.13	1.16	1.13	1.18	1.2	1.18	1.09
Yb	2.36	2.3	2.29	2.42	2.39	2.38	2.34	2.29	2.24
Lu	0.333	0.318	0.339	0.336	0.334	0.352	0.337	0.337	0.341
Hf	7.22	7.34	7.21	7.27	7.24	7.35	7.35	7.12	6.91
Ta	1.40	1.37	1.40	1.37	1.39	1.43	1.43	1.42	1.32
Th	6.51	6.64	6.59	6.33	6.27	6.48	6.43	6.27	6.65

EXAMPLE

Table 2. Trace-element compositions of Lathrop Wells basalts determined by INAA

LW31FVP	LW32FVP	LW63FVP	LW64FVP	LW65FVP	LW66FVP	LW67FVP	LW110FVP	LW115FVP	LW93FVP	LW20FVP
Qllc	Qllc	Qllc	Qllc	Qllc	Qllc	Qllc	Qllc	Qllc	Qslc	Qlld
21	18	22.1	23	20.2	22	21	22	26	20	22
19	18.9	19.4	19.11	19.13	19.46	19.42	19.52	19.66	19.01	18.6
30.2	30.6	31.56	30.27	30.58	30.58	31.32	30.8	31.2	30.74	30.3
1410	1390	1410	1450	1490	1450	1420	1420	1450	1410	1460
1430	1450	1430	1430	1460	1450	1450	1510	1500	1470	1370
92	92.9	93.2	92.6	93.3	93.8	93.3	93.5	94.2	92.8	91.9
179	181	182.4	180.2	183.4	182.6	182	183	181.8	181.3	183
71	80	74	74	75	73	74	79	78	75	77
12.1	12.4	12.23	12.2	12.5	12.43	12.24	12.39	12.26	12.29	12.5
3.09	3.16	3.16	3.11	3.21	3.17	3.14	3.17	3.16	3.11	3.23
1.09	1.13	1.11	1.13	1.181	1.15	1.14	1.15	1.18	1.19	1.14
2.28	2.35	2.37	2.39	2.36	2.4	2.42	2.33	2.37	2.37	2.36
0.353	0.338	0.345	0.338	0.334	0.343	0.35	0.338	0.341	0.346	0.332
7	7.29	7.31	7.27	7.28	7.36	7.24	7.19	7.36	7.34	7.26
1.34	1.37	1.34	1.35	1.38	1.39	1.36	1.39	1.36	1.39	1.36
6.84	6.56	6.82	6.73	6.69	6.84	6.77	6.84	6.73	6.59	6.17

Table 2. Trace-element compositions of Lathrop Wells basalts determined by INAA

LW21FVP	LW22FVP	LW23FVP	LW79FVP	LW01FVP	LW71FVP	LW8FVP	LW9FVP	LW10FVP	LW33FVP	LW34FVP
Qlld	Qlld	Qlld	Qsld	Qslr	Qslr	Qslu	Qslu	Qslu	Qslu	Qslu
19.3	19	20	20	22	20	23	21	20	20	21
18.3	18.7	18.4	18.68	19.1	19	19.27	19.13	18.67	19.5	19.5
30.4	31.5	30.9	31.3	30.7	31	31.2	30.9	30.3	30.6	31.8
1520	1500	1490	1490	1420	1420	1540	1450	1470	1400	1390
1320	1350	1330	1360	1430	1400	1430	1430	1400	1420	1460
90.3	92.6	91.7	92.6	93.1	94.6	95.2	94	92.1	94.1	94.3
181	184	183	184.4	183	187	184.9	185.4	178.4	183	184
78	73	81	78	74	73	79	76	80	77	70
12.4	12.7	12.5	12.77	12.5	12.9	12.64	12.55	12.29	12.4	12.3
3.24	3.28	3.28	3.26	3.18	3.31	3.28	3.22	3.17	3.18	3.22
1.14	1.17	1.15	1.19	1.14	1.16	1.18	1.19	1.15	1.1	1.12
2.34	2.42	2.27	2.42	2.36	2.47	2.32	2.32	2.29	2.4	2.37
0.306	0.356	0.368	0.338	0.346	0.354	0.328	0.331	0.339	0.354	0.366
7.04	7.17	7.16	7.29	7.35	7.29	7.31	7.23	7.11	7.24	7.26
1.37	1.39	1.39	1.38	1.36	1.43	1.42	1.40	1.39	1.35	1.39
5.94	6.05	5.97	6.34	6.64	6.12	6.59	6.49	6.46	6.71	6.73

EXAMPLE

Table 2. Trace-element compositions of Lathrop Wells basalts determined by INAA

LW35FVP	LW42FVP	LW43FVP	LW46FVP	LW47FVP	LW49FVP	LW50FVP	LW51FVP	LW98FVP	LW99FVP	LW103FVP
Qslu	Qslu	Qslu	Qslu	Qslu	Qslu	Qslu	Qslu	Qslu	Qslu	Qslu
20	19	21	21	22	20	19.1	22	21	18	22
19.3	18.2	18.5	18.86	19.31	19	19.02	19.1	19.28	19.41	19.05
30.8	29.4	30.6	30.31	31.05	31.1	30.53	30.8	31	31.1	30.73
1350	1430	1410	1430	1400	1430	1440	1430	1460	1430	1460
1420	1340	1360	1430	1450	1420	1440	1450	1470	1450	1450
94.4	90.3	91.5	92.3	93.6	92.3	92.8	92.8	94.7	95.9	93.7
182	179	183	181.1	183.7	181	181.6	182	186.2	187.8	183.8
73	79	79	76	81	73	73	77	79	79	77
12.4	12.1	12.6	12.32	12.4	12.3	12.29	12.4	12.76	12.78	12.59
3.18	3.17	3.25	3.12	3.2	3.15	3.16	3.19	3.27	3.32	3.22
1.1	1.1	1.17	1.13	1.15	1.1	1.16	1.14	1.19	1.19	1.16
2.33	2.4	2.38	2.35	2.44	2.32	2.39	2.32	2.34	2.42	2.38
0.367	0.313	0.343	0.336	0.34	0.355	0.339	0.344	0.337	0.325	0.336
7.06	6.96	7.22	7.29	7.3	7.11	7.21	7.2	7.29	7.37	7.4
1.37	1.34	1.38	1.37	1.39	1.38	1.36	1.39	1.41	1.42	1.37
6.65	6.24	6.11	6.67	6.86	6.55	6.6	6.68	6.59	6.65	6.66

Table 2. Trace-element compositions of Lathrop Wells basalts determined by INAA

LW113FVP	LW116FVP	LW112FVP	LW06FVP	LW07FVP	LW19FVP	LW40FVP	LW41FVP	LW44FVP	LW25FVP	LW27FVP
Qs1u	Qs1u	Ql1u	Ql2a	Ql2a	Ql2a	Ql2a	Ql2a	Ql2a	Ql2b	Ql2b
23	19	18	19	22	23	23	21	20	21	21
19.12	19.09	18.9	19.4	19.9	20.1	19.75	19.8	19.3	19	19.3
30.9	31.3	32.9	30.6	30.5	30.4	29.5	30.1	30.4	30.6	30.7
1470	1440	1490	1310	1310	1390	1403	1330	1400	1470	1450
1420	1420	1460	1460	1440	1480	1450	1430	1390	1420	1400
94.1	94.3	93.3	92	93.5	94.6	93.5	93.9	92	93.2	93.6
183.2	183.2	185.6	179	181	183.4	182.8	181	178	183	183
82	88	77	73	70	74	75	71	72	76	79
12.69	12.66	12.69	12	11.9	12.28	12.12	12.2	12	12.1	12.1
3.29	3.3	3.19	3.05	3.15	3.14	3.16	3.11	3.08	3.13	3.19
1.21	1.16	1.18	1.1	1.11	1.11	1.18	1.12	1.09	1.11	1.08
2.31	2.39	2.35	2.24	2.4	2.36	2.43	2.38	2.32	2.32	2.38
0.346	0.33	0.337	0.335	0.325	0.343	0.337	0.388	0.351	0.327	0.342
7.26	7.27	7.11	7.02	7.29	7.23	7.32	7.24	6.92	7.1	7.22
1.41	1.42	1.42	1.35	1.32	1.39	1.39	1.40	1.35	1.39	1.36
6.55	6.54	6.38	6.89	6.98	7.15	7.06	6.9	6.84	6.59	6.51

EXAMPLE

Table 2. Trace-element compositions of Lathrop Wells basalts determined by INAA

LW28FVP	LW29FVP	LW96FVP	LW97FVP	LW104FVP	LW114FVP	LW118FVP	LW119FVP	LW126FVP	LW127FVP
Ql2b	Ql2b	Qs2fs	Qs2fs	Qs2fs	Qs2fs	Qs2fs	Qs2fs	Qs2fs	Qs2fs
22	21	21.6	20	22	24	23	25	20	22
19.7	19.3	19.29	19.37	19.15	19.83	19.53	19.82	20.2	19.11
29.7	30.9	30.48	31.13	30.76	31.2	30.2	30.4	30.7	30.6
1390	1370	1400	1380	1460	1410	1380	1370	1530	1470
1410	1400	1410	1400	1430	1450	1410	1430	1460	1470
93.8	93.8	93.2	92.8	91.6	94.2	93	94.1	95.2	92.1
180	183	180.1	179.7	181.3	179.8	177.7	177.3	185.7	180.6
78	76	75	75	79	80	75	81	76	74
11.9	12.4	12	12.04	12.03	12.28	12.06	12.01	12.24	12.12
3.1	3.21	3.12	3.11	3.12	3.15	3.1	3.12	3.18	3.12
1.11	1.13	1.12	1.1	1.1	1.13	1.1	1.14	1.16	1.15
2.33	2.35	2.38	2.37	2.33	2.38	2.28	2.43	2.39	2.24
0.334	0.348	0.339	0.341	0.328	0.333	0.334	0.34	0.333	0.349
7.16	7.31	7.17	7.11	7.24	7.22	7.18	7.14	7.24	7.13
1.37	1.34	1.38	1.37	1.37	1.39	1.37	1.41	1.41	1.40
7.12	6.61	6.86	6.84	6.83	6.96	7.03	7.12	7.09	6.66

Table 2. Trace-element compositions of Lathrop Wells basalts determined by INAA

LW130FVP	LW132FVP	LW135FVP	LW36FVP	LW37FVP	LW38FVP	LW60FVP	LW61FVP	LW62FVP	LW02FVP	LW03FVP
Qs2fs	Qs2fs	Qs2fs	Qs2u	Qs2u	Qs2u	Ql3	Ql3	Ql3	Qs3	Qs3
22	19	25	22	22	23	20.3	21	22	23	23
19.75	19.34	19.51	19.6	19.7	19.5	19.9	19.7	19.9	20.3	19.7
31.4	30.8	30.7	30.9	31.1	31.2	30	29.8	29.9	28.1	30.3
1400	1410	1410	1320	1310	1380	1330	1460	1330	1330	1340
1420	1440	1490	1460	1430	1400	1410	1430	1380	1410	1410
93.7	91.2	92.6	94.2	95	94.1	94.4	94.1	94.6	97.1	93.3
179.1	175.4	183.7	184	185	184	181	179	180	186	178
82	75	78	72	72	71	65	74	71	77	68
12.12	11.98	12.19	12.2	12.3	12.3	12.1	12	12.1	12.2	12
3.15	3.01	3.17	3.16	3.18	3.22	3.1	3.06	3.12	3.16	3.06
1.14	1.12	1.17	1.11	1.11	1.14	1.11	1.1	1.1	1.13	1.07
2.33	2.29	2.33	2.36	2.35	2.37	2.35	2.34	2.38	2.36	2.43
0.323	0.329	0.318	0.352	0.344	0.331	0.359	0.338	0.346	0.36	0.339
7.16	7.03	7.23	7.28	7.34	7.2	7.14	7.12	7.21	7.41	7.22
1.40	1.39	1.39	1.37	1.36	1.34	1.38	1.37	1.37	1.38	1.40
7	6.86	6.78	6.78	6.93	6.66	7.26	7.29	7.4	7.69	7.19

EXAMPLE

Table 2. Trace-element compositions of Lathrop Wells basalts determined by INAA

LW69FVP	LW70FVP	LW75FVP	LW76FVP	LW80FVP	LW81FVP	LW82BFVP	LW82RFVP	LW86FVP	LW87FVP	LW88FVP
Qs3	Qs3	Qs3	Qs3	Qs3	Qs3	Qs3	Qs3	Qs3	Qs3	Qs3
23	21	21.6	20.2	21	24	24	20	21	22.4	23
19.9	19.9	19.71	19.84	19.5	19.9	20.03	19.92	20.13	20.07	19.84
29.4	30	30.62	30.66	30	30.3	29.77	30.54	29.83	29.68	29.68
1400	1390	1380	1410	1410	1370	1400	1370	1410	1430	1400
1400	1420	1400	1400	1430	1420	1460	1420	1430	1431	1420
94.6	95.1	93.8	93.2	93.2	94.7	95.6	94.8	96.1	96	94.6
182	182	180.5	181.1	178	182	183.9	181.9	184.4	184.9	182.4
80	72	75	75	78	76	75	74	70	74	72
12.1	12.1	12.06	11.94	11.8	12.2	11.94	12.18	12.26	12.22	12.06
3.11	3.12	3.06	3.11	3.1	3.12	3.11	3.14	3.1	3.15	3.09
1.11	1.09	1.14	1.17	1.1	1.11	1.12	1.15	1.15	1.13	1.15
2.38	2.29	2.37	2.36	2.28	2.33	2.39	2.39	2.41	2.44	2.45
0.361	0.344	0.341	0.353	0.37	0.357	0.348	0.349	0.36	0.351	0.349
7.15	7.22	7.29	7.2	6.98	7.13	7.41	7.37	7.43	7.31	7.23
1.37	1.37	1.39	1.37	1.36	1.37	1.39	1.36	1.39	1.35	1.34
7.28	7.25	7.03	7.13	6.92	7.35	7.56	6.97	7.42	7.53	7.47

Table 2. Trace-element compositions of Lathrop Wells basalts determined by INAA

LW95FVP	LW123FVP	LW133FVP-R	LW133FVP-B	LW78FVP-B	LW78FVP-R	LW124FVP-B	LW124FVP-R	LW134FVP
Qs3	Qs3	Qs4a	Qs4a	Qs4b	Qs4b	Qs4b	Qs4b	Qs4b
18	21	21	21	34	34.4	32	28	36
20.28	19.57	19.57	19.57	18.76	19.03	19.15	19.29	19.09
30.65	30.6	32.8	32	28.88	28.89	28.9	28.7	29.5
1450	1340	1390	1340	1290	1250	1300	1270	1260
1390	1450	1410	1450	1360	1330	1430	1380	1410
96.6	92.6	92.2	92.2	91.7	96.2	91.1	93.7	96.4
186.3	178.8	182.8	179.5	175.9	179.6	176.2	179.1	188.6
77	77	74	80	73	75	71	73	75
12.4	11.89	11.95	11.95	11.8	12.57	11.91	12.13	12.56
3.19	3.05	3.07	3.07	2.91	3.07	2.96	2.96	3.15
1.14	1.16	1.11	1.11	1.12	1.23	1.16	1.16	1.23
2.48	2.33	2.48	2.3	2.54	2.8	2.48	2.49	2.89
0.348	0.334	0.35	0.349	0.38	0.405	0.35	0.399	0.403
7.35	7.05	7.15	7.13	7.4	7.35	7.38	7.2	7.69
1.39	1.40	1.41	1.39	1.38	1.38	1.38	1.42	1.47
7.34	6.89	6.88	6.88	8.32	9.01	8.1	8.18	9.18

EXAMPLE

Table 2. Trace-element compositions of Lathrop Wells basalts determined by INAA

LW15FVP	LW16FVP	LW14FVP
Qs4c	Qs4c	?
18	21	20
19.4	19.1	19.5
36.5	35.8	30
1240	1230	1280
1350	1310	1390
90.3	89.7	90.3
174	172	178
67	66	68
11.4	11.3	11.2
3	2.94	2.99
1.06	1.04	1.03
2.23	2.18	2.23
0.333	0.314	0.334
6.94	6.87	7.22
1.28	1.27	1.30
6.77	6.82	6.8

Table 3. Replicate INAA analyses of LW27FVP

Sample	Sc	Co	Rb	Sr	Ba	La	Ce	Nd
LW27FVP[1]	19.3	30.7	21	1450	1400	93.6	183	79
NM18FVP[1]	19.4	31.1	18	1370	1430	93.9	183	71
NM19FVP[1]	19.[illegible]	30.7	23	1410	1430	92.8	181	73
NM20FVP[1]	19.3	30.8	19	1420	1440	93.3	183	78
NM30FVP[2]	19.23	30.81	21	1430	1430	93.4	183.4	77
NM33FVP[2]	19.2	30.64	20.3	1440	1430	92.9	183.8	78
NM34FVP[2]	19.24	30.66	21	1440	1460	93.1	182.7	77
NM41FVP[2]	19.15	30.66	21	1430	1440	92.6	182.5	77
NM42FVP[3]	19.13	30.6	20	1410	1470	92.8	181.3	77
NM43FVP[3]	19.44	31.2	20	1430	1500	94.2	183.7	78
NM45FVP[3]	19.36	30.7	17	1440	1480	93.8	183	75
NM48FVP[3]	19.42	31	18	1360	1470	93.7	183.7	73
Mean	19.28	30.80	19.94	1419.17	1448.33	93.54	182.84	76.08
Standard Deviation	0.11	0.20	1.68	28.11	27.91	0.51	0.89	2.50
Percent Standard Deviation (100·s/mean)	0.55	0.64	8.42	1.98	1.93	0.55	0.49	3.29

Sample	Sm	Eu	Tb	Yb	Lu	Hf	Ta	Th
LW27FVP[1]	12.1	3.19	1.08	2.38	0.340	7.22	1.36	6.51
NM18FVP[1]	12.4	3.19	1.13	2.35	0.350	7.22	1.38	6.65
NM19FVP[1]	12.4	3.16	1.14	2.33	0.360	7.23	1.4	6.68
NM20FVP[1]	12.4	3.19	1.13	2.25	0.360	7.14	1.37	6.56
NM30FVP[2]	12.33	3.17	1.12	2.39	0.332	7.37	1.36	6.71
NM33FVP[2]	12.36	3.19	1.14	2.41	0.340	7.36	1.37	6.77
NM34FVP[2]	12.47	3.19	1.16	2.39	0.342	7.27	1.38	6.76
NM41FVP[2]	12.26	3.19	1.17	2.33	0.341	7.3	1.36	6.80
NM42FVP[3]	12.39	3.16	1.18	2.31	0.336	7.33	1.42	6.68
NM43FVP[3]	12.64	3.22	1.19	2.35	0.335	7.33	1.4	6.63
NM45FVP[3]	12.56	3.24	1.19	2.31	0.353	7.34	1.34	6.60
NM48FVP[3]	12.33	3.28	1.17	2.33	0.339	7.39	1.34	6.87
Mean	12.39	3.20	1.15	2.34	0.344	7.29	1.37	6.69
Standard Deviation	0.14	0.03	0.03	0.04	0.009	0.08	0.02	0.10
Percent Standard Deviation (100·s/mean)	1.11	1.08	2.85	1.89	2.76	1.04	1.77	1.55

[1,2,3] Sample group

EXAMPLE

Table 4. Isotopic and trace-element compositions of Lathrop Wells Basalts determined by solid-source mass spectrometry

Sample	LW11FVP	LW12FVP	LW20FVP	LW22FVP	LW113FVP	LW7FVP	LW41FVP	LW27FVP	LW29FVP	LW96FVP	LW97FVP	LW118FVP
Unit	Ql1a	Ql1a	Ql1d	Ql1d	Qs1u	Ql2a	Ql2a	Ql2b	Ql2b	Qs2fs	Qs2fs	Qs2fs
Rb	19.70	19.10	17.76	15.68	20.60	19.90	20.47	19.36	19.60	20.50	20.40	21.40
Sr	1452	1446	1482	1495	1461	1399	1395	1424	1431	1410	1413	1386
$^{87}Sr/^{86}Sr$	0.707021	0.707047	0.707084	0.707077	0.707039	0.707006	0.707011	0.707033	0.707034	0.706978	0.707044	0.707003
Sm	12.43	12.33	12.56	12.79	12.40	12.00	12.05	12.16	12.26	12.10	12.00	11.90
Nd	90.10	89.11	90.50	91.99	89.20	86.50	87.30	87.99	88.44	87.60	86.70	86.10
$^{143}Nd/^{144}Nd$	0.512135	0.512110	0.512142	0.512142	0.512130	0.512123	0.512125	0.512114	0.512124	0.512120	0.512123	0.512113
ε_{Nd}	-9.81	-10.30	-9.68	-9.68	-9.91	-10.00	-10.01	-10.22	-10.03	-10.10	-10.00	-10.20
Pb	11.0	11.1	10.1	10.2	11.1	11.7	10.8	11.0	11.0	12.3	12.2	11.8
$^{206}Pb/^{204}Pb$	38.264	38.323	38.32	38.343	38.288	38.296	38.222	38.316	38.365	38.36	38.328	38.323
$^{207}Pb/^{204}Pb$	15.514	15.528	15.52	15.527	15.519	15.527	15.505	15.528	15.542	15.545	15.536	15.535
$^{208}Pb/^{204}Pb$	18.345	18.353	18.372	18.389	18.355	18.336	18.312	18.343	18.354	18.352	18.341	18.361

Table 4. Isotopic and trace-element compositions of Lathrop Wells Basalts determined by solid-source mass spectrometry

Sample	LW80FVP	LW81FVP	LW15FVP	LW16FVP
Unit	Qs3	Qs3	Qs4c	Qs4c
Rb	20.62	20.59	19.57	19.64
Sr	1375	1361	1321	1321
$^{87}Sr/^{86}Sr$	0.707024	0.707022	0.707062	0.707062
Sm	11.89	11.84	11.43	11.39
Nd	85.97	85.80	82.90	82.88
$^{143}Nd/^{144}Nd$	0.512126	0.512138	0.512120	0.512132
ε_{Nd}	-9.99	-9.75	-10.10	-9.87
Pb	14.9	13.1	12.4	11.2
$^{208}Pb/^{204}Pb$	38.032	38.288	[illegible].269	38.33
$^{207}Pb/^{204}Pb$	15.486	15.54	15.52	15.537
$^{206}Pb/^{204}Pb$	18.17	18.522	18.332	18.349

EXAMPLE

Table 5. Replicate solid-source mass spectroscopy analyses of LW41FVP

Sample	Rb	Sr	$^{87}Sr/^{86}Sr$	Sm	Nd	$^{143}Nd/^{144}Nd$	ε_{Nd}	Pb	$^{208}Pb/^{204}Pb$	$^{207}Pb/^{204}Pb$	$^{206}Pb/^{204}Pb$
LW41FVP	20.47	1395.00	0.707011	12.1	87.3	0.512125	-10.01	10.8	38.222	15.505	18.312
LW13FVP	19.54	1380.00	0.707042	12.0	87.1	0.512125	-10.01	10.8	38.231	15.51	18.322
DP3FVP	20.50	1407.00	0.707018	12.0	87.2	0.512118	-10.14	10.7	38.282	15.524	18.335
DP4FVP	20.50	1412.00	0.707002	11.9	87.2	0.512134	-9.83	10.8	38.329	15.538	18.343
DP5FVP	20.20	1398.00	0.707013	12.1	86.9	0.512127	-9.97	10.0	38.217	15.504	18.33
DP8FVP	20.20	1407.00	0.707007	12.0	86.6	0.512132	-9.87	10.5	38.24	15.511	18.328
Mean	20.24	1399.83	0.707016	12.01	87.04	0.512127	-9.97	10.59	38.254	15.515	18.328
Standard Deviation	0.37	11.58	0.000014	0.06	0.26	0.000006	0.11	0.34	0.044	0.013	0.011
Percent Standard Deviation (100·s/mean)	1.828	0.827	0.002	0.479	0.296	0.001	1.11	3.166	0.114	0.085	0.058

EXAMPLE

Table 6. Composition of olivine phenocrysts and groundmass (gm) from LW21FVP of Ql1d

Point	lw21fvp_#1ab	lw21fvp_#1a	lw21fvp_#1a	lw21fvp_#1a	lw21fvp_#1a	lw21fvp_#1a	lw21fvp_#1ae	lw21fvp_#1bb	lw21fvp_#1b	lw21fvp_#1b
SiO_2	38.04	38.80	38.26	37.99	38.26	38.09	37.96	38.16	38.00	38.10
MgO	36.91	40.19	38.85	38.75	39.21	40.09	39.73	39.74	39.98	40.12
FeO	24.46	20.70	22.04	22.35	21.78	20.96	21.32	21.00	20.59	20.65
CaO	0.19	0.14	0.15	0.13	0.13	0.13	0.17	0.16	0.14	0.14
MnO	0.35	0.30	0.32	0.29	0.31	0.28	0.30	0.26	0.32	0.27
NiO	0.13	0.29	0.16	0.18	0.21	0.25	0.23	0.24	0.27	0.23
TOTAL	100.08	100.42	99.76	99.69	99.90	99.79	99.70	99.56	99.29	99.50
Cations based on 4 oxygens										
Si	1.00	1.00	1.00	0.99	1.00	0.99	0.99	0.99	0.99	0.99
Mg	1.45	1.54	1.51	1.51	1.52	1.55	1.54	1.54	1.55	1.56
Fe	0.54	0.45	0.48	0.49	0.47	0.46	0.46	0.46	0.45	0.45
Ca	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
Mn	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Ni	0.00	0.01	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01
Fo	72.81	77.48	75.75	75.45	76.11	77.22	76.80	77.08	77.46	77.51
Fa	27.06	22.39	24.11	24.41	23.73	22.65	23.12	22.85	22.38	22.39

EXAMPLE

Table 6. Composition of olivine phenocrysts and groundmass (gm) from LW21FVP of Qi1d

lw21fvp_#1be	lw21fvp_#2b	lw21fvp_#2	lw21fvp_#2	lw21fvp_#2	lw21fvp_#2	lw21fvp_#2	lw21fvp_#2e	lw21fvp_3b	lw21fvp_3	lw21fvp_3	lw21fvp_3
37.62	37.64	37.73	38.08	38.62	38.26	38.17	37.63	35.92	37.81	37.41	37.46
39.17	38.18	40.02	40.24	40.43	40.10	39.97	38.27	32.51	40.34	40.35	40.15
21.57	23.24	21.16	20.59	20.99	20.94	21.08	22.90	29.51	20.82	20.92	20.61
0.19	0.25	0.13	0.12	0.14	0.14	0.14	0.19	0.29	0.14	0.12	0.13
0.28	0.30	0.25	0.27	0.33	0.29	0.32	0.34	0.55	0.23	0.26	0.26
0.16	0.05	0.23	0.23	0.24	0.26	0.22	0.16	0.04	0.31	0.29	0.26
98.98	99.68	99.51	99.53	100.75	100.01	99.90	99.48	98.82	99.64	99.36	98.86
0.99	0.99	0.98	0.99	0.99	0.99	0.99	0.99	0.99	0.98	0.98	0.98
1.53	1.50	1.56	1.56	1.55	1.55	1.55	1.50	1.33	1.56	1.57	1.57
0.47	0.51	0.46	0.45	0.45	0.45	0.46	0.50	0.68	0.45	0.46	0.45
0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.01	0.01	0.01
76.37	74.55	77.05	77.60	77.30	77.24	77.05	74.78	66.11	77.50	77.37	77.55
23.59	25.46	22.86	22.27	22.52	22.63	22.80	25.10	33.68	22.44	22.51	22.34

Table 6. Composition of olivine phenocrysts and groundmass (gm) from LW21FVP of Ql1d

lw21fvp_3	lw21fvp_3	lw21fvp_3c	lw21fvp_#4ab	lw21fvp_#4a	lw21fvp_#4a	lw21fvp_#4a	lw21fvp_#4a	lw21fvp_#4a	lw21fvp_#4ac	lw21fvp_#4bb
37.19	37.03	36.80	37.32	37.60	37.81	37.73	37.66	37.89	37.81	38.19
39.97	39.64	38.96	38.07	40.06	39.47	39.40	39.58	40.05	40.12	40.29
20.39	21.28	21.71	23.02	20.73	21.53	21.26	21.39	20.62	20.14	20.72
0.14	0.17	0.17	0.26	0.15	0.16	0.15	0.14	0.12	0.15	0.12
0.26	0.30	0.31	0.36	0.28	0.26	0.28	0.33	0.26	0.33	0.28
0.28	0.22	0.11	0.12	0.21	0.19	0.18	0.22	0.22	0.16	0.20
98.23	98.63	98.06	99.15	99.04	99.42	98.99	99.32	99.16	98.70	99.80
0.98	0.98	0.98	0.99	0.98	0.99	0.99	0.99	0.99	0.99	0.99
1.57	1.56	1.55	1.50	1.56	1.54	1.54	1.54	1.56	1.57	1.56
0.45	0.47	0.48	0.51	0.45	0.47	0.47	0.47	0.45	0.44	0.45
0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.01	0.01	0.01	0.01	0.01	[illegible]	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00
77.68	76.[illegible]	76.10	74.64	77.43	76.52	76.68	76.61	77.50	77.91	77.50
22.23	23.13	23.79	25.33	22.47	23.42	23.22	23.22	22.39	21.94	22.36

EXAMPLE

Table 6. Composition of olivine phenocrysts and groundmass (gm) from LW21FVP of Ql1d

lw21fvp_#4b	lw21fvp_#4b	lw21fvp_#4be	lw21fvp_#5ab	lw21fvp_#5a	lw21fvp_#5a	lw21fvp_#5a	lw21fvp_#5a	lw21fvp_#5a	lw21fvp_#5ae	lw21fvp_#6b
38.08	38.23	36.36	37.88	38.19	38.35	38.27	38.28	38.24	38.00	36.97
40.38	40.21	34.10	39.35	39.72	39.98	39.68	39.82	39.97	38.41	34.98
20.57	20.68	27.65	21.79	20.96	21.60	21.52	21.58	21.22	22.94	26.54
0.15	0.14	0.48	0.21	0.17	0.13	0.13	0.13	0.12	0.17	0.25
0.27	0.25	0.44	0.32	0.29	0.25	0.23	0.26	0.30	0.34	0.40
0.27	0.23	0.15	0.07	0.18	0.29	0.16	0.26	0.24	0.11	0.12
99.72	99.75	99.17	99.61	99.56	100.60	100.00	100.33	100.08	99.95	99.25
0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
1.56	1.55	1.38	1.53	1.54	1.54	1.54	1.54	1.54	1.50	1.40
0.45	0.45	0.63	0.48	0.46	0.47	0.47	0.47	0.46	0.50	0.60
0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.00	0.00
77.71	77.54	68.86	76.25	77.09	76.67	76.61	76.60	76.92	74.80	70.07
22.21	22.37	31.33	23.69	22.82	23.24	23.31	23.29	22.92	25.06	29.84

Table 6. Composition of olivine phenocrysts and groundmass (gm) from LW21FVP of Ql1d

lw21fvp_#6	lw21fvp_#6	lw21fvp_#6	lw21fvp_#6e	lw21fvp_7a	lw21fvp_7a	lw21fvp_7a	lw21fvp_7a	lw21fvp_7a	lw21fvp_7b	lw21fvp_7b	lw21fvp_7b
38.20	37.54	38.15	37.83	37.61	38.16	38.10	38.24	38.25	38.33	38.26	38.20
39.85	39.96	40.27	37.93	37.[illegible]9	40.26	40.36	40.14	40.24	40.20	40.24	40.07
21.06	20.89	20.97	23.43	23.52	21.20	21.13	21.12	20.89	21.25	21.01	20.93
0.14	0.12	0.15	0.20	0.25	0.16	0.16	0.12	0.13	0.18	0.13	0.15
0.23	0.29	0.27	0.34	0.33	0.23	0.24	0.26	0.23	0.30	0.27	0.21
0.27	0.22	0.23	0.19	0.14	0.21	0.20	0.23	0.23	0.21	0.28	0.23
99.75	99.00	100.04	99.91	99.25	100.22	100.18	100.11	99.98	100.46	100.19	99.79
0.99	0.98	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
1.54	1.56	1.56	1.48	1.47	1.55	1.56	1.55	1.55	1.55	1.55	1.55
0.46	0.46	0.45	0.51	0.52	0.46	0.46	0.46	0.45	0.46	0.45	0.45
0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.00
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01
77.09	77.20	77.32	74.19	73.91	77.1[illegible]	77.26	77.11	77.39	77.06	77.26	77.32
22.86	22.64	22.59	25.72	26.08	[illegible]	22.70	22.77	22.54	22.85	22.63	22.66

EXAMPLE

Table 6. Composition of olivine phenocrysts and groundmass (gm) from LW21FVP of Qlld

lw21fvp_7b	lw21fvp_8b	lw21fvp_8	lw21fvp_8	lw21fvp_8	lw21fvp_8	lw21fvp_8e	lw21fvp_9b	lw21fvp_9	lw21fvp_9	lw21fvp_9e	lw21fvp_9ab
38.30	37.56	37.47	37.37	37.52	37.61	35.61	37.68	37.44	37.62	37.57	37.25
39.98	39.80	39.09	39.25	39.57	39.40	31.69	39.86	40.00	40.10	40.10	38.15
21.17	21.47	22.14	22.12	21.52	21.66	30.64	21.00	21.08	20.71	20.93	22.86
0.16	0.15	0.16	0.10	0.15	0.17	0.35	0.16	0.13	0.12	0.15	0.25
0.24	0.25	0.30	0.29	0.29	0.32	0.58	0.28	0.27	0.25	0.29	0.37
0.24	0.26	0.21	0.14	0.28	0.21	0.03	0.30	0.25	0.27	0.25	0.10
100.07	99.49	99.37	99.27	99.33	99.38	98.90	99.28	99.17	99.06	99.29	98.97
0.99	0.98	0.98	0.98	0.98	0.99	0.98	0.99	0.98	0.98	0.98	0.99
1.54	1.55	1.53	1.54	1.55	1.54	1.30	1.55	1.56	1.56	1.56	1.51
0.46	0.47	0.49	0.49	0.47	0.48	0.71	0.46	0.46	0.45	0.46	0.51
0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.00	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.00	0.00	0.01	0.00	0.00	0.01	0.01	0.01	0.01	0.00
77.06	76.71	75.80	75.84	76.53	76.33	64.72	77.13	77.10	77.46	77.26	74.80
22.90	23.22	24.09	23.98	23.35	23.55	35.12	22.79	22.79	22.44	22.62	25.15

Table 6. Composition of olivine phenocrysts and groundmass (gm) from LW21FVP of Qlld

lw21fvp_9a	lw21fvp_9a	lw21fvp_9a	lw21fvp_9a	lw21fvp_9ae	lw21fvp_#12b	lw21fvp_#12	lw21fvp_#12	lw21fvp_#12	lw21fvp_#12e	lw21fvp_#14b
37.78	37.64	37.53	37.43	37.55	37.87	38.45	38.26	38.24	37.43	37.87
39.69	39.70	40.13	39.94	39.89	38.41	39.92	39.92	39.81	35.52	37.91
21.31	21.05	21.26	21.09	21.34	22.77	21.31	21.46	21.28	26.02	23.90
0.15	0.15	0.15	0.15	0.20	0.42	0.17	0.16	0.15	0.24	0.19
0.22	0.26	0.29	0.26	0.27	0.33	0.27	0.29	0.28	0.53	0.32
0.21	0.21	0.18	0.20	0.21	0.07	0.16	0.20	0.16	0.14	0.11
99.36	99.01	99.54	99.07	99.45	99.85	100.27	100.29	99.92	99.88	100.30
0.99	0.99	0.98	0.98	0.98	0.99	0.99	0.99	0.99	1.00	0.99
1.55	1.55	1.56	1.56	1.55	1.50	1.54	1.54	1.54	1.41	1.48
0.47	0.46	0.46	0.46	0.47	0.50	0.46	0.47	0.46	0.58	0.52
0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
76.83	77.01	77.01	77.08	76.90	75.20	76.90	76.75	76.84	70.69	73.81
23.14	22.91	22.89	22.84	23.08	25.02	23.04	23.15	23.05	29.05	26.11

EXAMPLE

Table 6. Composition of olivine phenocrysts and groundmass (gm) from LW21FVP of Qlld

lw21fvp_#14	lw21fvp_#14	lw21fvp_#14e	lw21fvp_#13a gm	lw21fvp_#13a gm	lw21fvp_#13bb gm	lw21fvp_#13b gm	lw21fvp_#13be gm	lw21fvp_#14ab gm	lw21fvp_#14ae gm
38.79	38.41	37.45	35.73	36.55	35.86	35.92	35.23	36.73	36.80
38.49	39.18	35.94	30.99	32.14	29.15	31.42	28.25	35.15	35.80
21.58	21.98	25.31	30.09	29.41	32.89	30.32	32.97	25.77	25.04
0.22	0.22	0.26	1.17	0.36	0.34	0.73	1.29	0.70	0.92
0.31	0.31	0.43	0.60	0.62	0.66	0.58	0.61	0.45	0.43
0.12	0.12	0.10	0.02	0.02	0.01	0.08	0.00	0.05	0.07
99.51	100.22	99.49	98.59	99.11	98.92	99.06	98.34	98.85	99.06
1.01	1.00	1.00	0.99	1.00	1.00	0.99	0.99	0.99	0.99
1.49	1.52	1.43	1.28	1.31	1.21	1.29	1.19	1.41	1.43
0.47	0.48	0.56	0.70	0.67	0.77	0.70	0.78	0.58	0.56
0.01	0.01	0.01	0.04	0.01	0.01	0.02	0.04	0.02	0.03
0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.02	0.01	0.01
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
76.05	76.03	71.59	65.42	65.95	61.07	65.14	61.19	71.21	72.42
23.92	23.93	28.29	35.64	33.86	38.66	35.26	40.06	29.29	28.42

Table 6. Composition of olivine phenocrysts and groundmass (gm) from LW21FVP of Qi1d

lw21fvp_#14a gm	lw21fvp_#14bb gm	lw21fvp_#14b gm	lw21fvp_#14ba gm
37.47	35.34	35.54	35.26
35.43	27.81	28.17	27.80
25.97	33.93	33.87	34.74
0.38	0.45	0.63	0.44
0.43	0.74	0.80	0.80
0.04	0.04	0.03	0.01
99.70	98.32	99.04	99.05
1.00	1.00	1.00	0.99
1.41	1.17	1.18	1.17
0.58	0.80	0.79	0.82
0.01	0.01	0.02	0.01
0.01	0.02	0.02	0.02
0.00	0.00	0.00	0.00
70.91	59.24	59.71	58.61
29.16	40.56	40.28	41.10

EXAMPLE

Table 7. Composition of olivine phenocrysts from LW73FVP of Ql1b

Point	lw73fvp_#1b	lw73fvp_#1	lw73fvp_#1	lw73fvp_#1	lw73fvp_#1e	lw73fvp_#3b	lw73fvp_#3	lw73fvp_#3	lw73fvp_#3	lw73fvp_#3e
SiO_2	37.52	37.20	37.80	37.73	37.04	35.92	36.56	36.89	37.99	35.50
MgO	38.69	39.81	39.69	39.19	37.56	36.80	39.66	40.20	40.22	34.99
FeO	22.49	21.32	21.57	22.14	23.56	24.95	21.72	21.16	21.60	25.99
CaO	0.16	0.18	0.17	0.18	0.18	0.20	0.15	0.15	0.16	0.84
MnO	0.37	0.31	0.23	0.30	0.37	0.41	0.24	0.30	0.36	0.43
NiO	0.16	0.13	0.18	0.17	0.16	0.04	0.19	0.24	0.21	0.13
TOTAL	99.39	98.94	99.65	99.72	98.87	98.31	98.52	98.94	100.53	97.88
Cations based on 4 oxygens										
Si	0.99	0.98	0.99	0.99	0.99	0.97	0.97	0.97	0.98	0.97
Mg	1.52	1.56	1.54	1.53	1.49	1.48	1.57	1.58	1.55	1.43
Fe	0.50	0.47	0.47	0.48	0.52	0.56	0.48	0.47	0.47	0.59
Ca	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.03
Mn	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Ni	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
Fo	75.26	76.82	76.62	75.87	73.86	72.31	76.45	77.10	76.71	71.10
Fa	24.55	23.08	23.36	24.05	25.99	27.51	23.49	22.78	23.11	29.64

EXAMPLE

Table 7. Composition of olivine phenocrysts from LW73F VP of Q11b

lw73fvp_#4b	lw73fvp_#4	lw73fvp_#4	lw73fvp_#4	lw73fvp_#4e	lw73fvp_#5b	lw73fvp_#5	lw73fvp_#5	lw73fvp_#5	lw73fvp_#5e	lw73fvp_#6
37.60	38.14	37.34	37.20	36.10	37.05	37.12	37.12	37.86	37.17	37.79
37.61	39.74	40.50	39.31	35.60	37.44	39.75	39.46	39.44	36.61	40.31
24.14	21.21	21.17	22.31	26.30	24.03	21.92	21.91	22.19	25.60	21.25
0.21	0.13	0.13	0.15	0.28	0.20	0.15	0.15	0.15	0.19	0.19
0.41	0.27	0.23	0.34	0.41	0.32	0.30	0.31	0.34	0.40	0.23
0.22	0.23	0.19	0.23	0.08	0.22	0.30	0.19	0.16	0.06	0.10
100.19	99.73	99.56	99.55	98.77	99.26	99.54	99.14	100.15	100.03	99.87
0.99	0.99	0.98	0.98	0.98	0.98	0.97	0.98	0.99	0.99	0.98
1.47	1.54	1.58	1.54	1.43	1.48	1.55	1.55	1.53	1.45	1.56
0.53	0.46	0.46	0.49	0.59	0.53	0.48	0.48	0.48	0.57	0.46
0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.00	0.01	0.00	0.01	0.01	0.00	0.00	0.00	0.00
73.40	76.87	77.27	75.72	70.66	73.46	76.28	76.14	75.88	71.69	77.18
26.44	23.01	22.66	24.12	29.28	26.46	23.60	23.73	23.96	28.13	22.83

Table 7. Composition of olivine phenocrysts from LW73FVP of Ql1b

lw73fvp_#6	lw73fvp_#6	lw73fvp_#6	lw73fvp_#6	lw73fvp_#6e
38.51	38.14	38.20	37.94	37.69
39.82	40.15	40.65	40.43	38.73
21.76	21.58	21.35	21.20	22.68
0.19	0.20	0.20	0.19	0.15
0.24	0.26	0.24	0.22	0.31
0.03	0.05	0.05	0.02	0.17
100.55	100.37	100.69	99.99	99.73
0.99	0.99	0.98	0.98	0.99
1.53	1.55	1.56	1.56	1.51
0.47	0.47	0.46	0.46	0.50
0.01	0.01	0.01	0.01	0.00
0.01	0.01	0.01	0.01	0.01
0.00	0.00	0.00	0.00	0.00
76.53	76.83	77.24	77.29	75.18
23.46	23.17	22.77	22.74	24.69

EXAMPLE

Table 8. Composition of olivine phenocrysts from LW40FVP of Ql2a

Point	lw40fvp#1a	lw40fvp#1b	lw40fvp#1c	lw40fvp#1d	lw40fvp#2b	lw40fvp#2	lw40fvp#2	lw40fvp#2	lw40fvp#2e	lw40fvp#4a	lw40fvp#4b
SiO_2	38.11	38.12	37.95	37.01	37.11	37.99	37.94	37.83	37.32	36.88	37.99
MgO	40.32	40.56	40.38	36.92	36.45	40.53	39.17	39.98	37.23	36.29	40.76
FeO	20.89	21.04	20.75	24.91	25.32	21.08	21.69	21.93	24.53	26.17	20.29
CaO	0.12	0.12	0.14	0.23	0.27	0.11	0.11	0.09	0.22	0.26	0.14
MnO	0.23	0.21	0.27	0.36	0.38	0.24	0.30	0.26	0.32	0.43	0.26
NiO	0.30	0.32	0.13	0.16	0.10	0.23	0.33	0.20	0.10	0.04	0.20
TOTAL	99.97	100.36	99.61	99.59	99.62	100.18	99.54	100.29	99.72	100.07	99.63
Cations based on 4 oxygens											
Si	0.99	0.99	0.99	0.98	0.99	0.98	0.99	0.98	0.99	0.98	0.99
Mg	1.56	1.56	1.56	1.46	1.45	1.56	1.53	1.55	1.47	1.44	1.58
Fe	0.45	0.46	0.45	0.55	0.56	0.46	0.47	0.48	0.54	0.58	0.44
Ca	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.01	0.01	0.00
Mn	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Ni	0.01	0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00
Fo	77.42	77.40	77.54	72.49	71.92	77.32	76.16	76.34	72.97	71.11	78.10
Fa	22.50	22.53	22.35	27.44	28.04	22.56	23.66	23.50	26.98	28.77	21.81

EXAMPLE

Table 8. Composition of olivine phenocrysts from LW40FVP of Ql2a

lw40fvp#4c	lw40fvp#4d	lw40fvp#4e	lw40fvp#4f	lw40fvp#4g	lw40fvp#4h	lw40fvp#5b	lw40fvp#5	lw40fvp#5	lw40fvp#5	lw40fvp#5	lw40fvp#5	lw40fvp#5e
38.20	38.36	38.04	38.25	38.31	36.95	37.48	37.88	37.85	38.03	38.05	38.71	37.14
40.99	40.58	41.02	40.98	40.76	35.29	38.18	40.57	40 14	40.55	41.02	40.83	38.53
19.97	21 03	20.52	20.07	20.43	26.98	23.30	20.83	21.18	21.00	20.53	20.16	23.43
0.15	0.16	0.13	0.14	0.12	0.28	0.14	0.15	0.15	0.14	0.13	0.11	0 16
0.23	0.29	0.22	0.29	0.27	0.45	0.33	0.25	0.22	0.26	0.23	0.27	0.34
0.20	0.22	0.22	0.30	0.25	0.07	0.15	0.24	0.28	0.34	0.21	0.21	0.13
99.74	100.63	100.16	100.03	100.13	100.01	99.58	99.92	99.82	100.32	100.16	100.30	99.72
0 99	0.99	0.98	0.99	0.99	0.99	0.99	0.98	0.98	0.98	0.98	1.00	0.98
1.58	1.56	1.58	1.58	1.57	1.41	1.50	1.57	1.56	1.56	1.58	1.56	1.51
0.43	0.45	0.44	0.43	0.44	0.60	0.51	0.45	0.46	0.45	0.44	0.43	0.52
0 00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0 01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0 01
0 00	0 01	0.01	0.01	0.01	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0 00
78.49	77.40	78.03	78.34	77.96	69.91	74.37	77.59	77.13	77.42	78.02	78.19	74 45
21.45	22.51	21.91	21.53	21.92	29.98	25.46	22.35	22.83	22.50	21.90	21.67	25.40

Table 8. Composition of olivine phenocrysts from LW40FVP of Ql2a

lw40fvp#6a	lw40fvp#6b	lw40fvp#6c	lw40fvp#6d	lw40fvp#6e
36.67	36.86	38.10	38.20	37.09
34.90	35.54	40.65	40.59	36.08
27.72	26.28	20.48	20.53	25.83
0.30	0.24	0.12	0.15	0.26
0.45	0.45	0.27	0.24	0.43
0.08	0.08	0.26	0.25	0.11
100.13	99.44	99.87	99.96	99.79
0.98	0.99	0.99	0.99	0.99
1.39	1.42	1.57	1.57	1.43
0.62	0.59	0.44	0.44	0.58
0.01	0.01	0.00	0.00	0.01
0.01	0.01	0.01	0.01	0.01
0.00	0.00	0.01	0.01	0.00
69.12	70.56	77.87	77.86	71.27
30.80	29.27	22.01	22.09	28.62

EXAMPLE

Table 9. Composition of olivine phenocrysts from LW135FVP of Qs2fs

Point	lw135_1b	lw135_1	lw135_1	lw135_1	lw135_1	lw135_1	lw135_1	lw135_1	lw135_1	lw135_1	lw135_1	lw135_1e	lw135_4ab
SiO_2	38.31	38.59	38.34	38.38	39.05	38.31	38.18	38.57	38.44	38.41	38.32	38.14	38.05
Cr_2O_3	0.00	0.01	0.01	0.05	0.03	0.02	0.00	0.01	0.01	0.00	0.00	0.01	0.00
FeO	21 94	21 54	21.87	21.87	21.80	22.03	22.18	22.07	21.90	21.05	21.52	22.56	21.00
MgO	39.42	39.59	39.74	39.56	39.57	39.50	39.73	39.51	39.71	39.31	39.71	39.26	39.28
MnO	0 38	0.27	0.31	0.30	0.27	0.30	0.29	0.31	0.27	0.29	0.30	0.40	0.31
CaO	0.18	0.15	0.14	0.13	0.13	0.15	0.16	0.14	0.13	0.17	0.17	0.15	0.20
NiO	0 16	0.25	0.22	0.26	0.25	0.08	0.22	0.21	0.19	0.18	0.19	0.13	0.04
TOTAL	100.39	100.39	100.63	100.54	101.11	100.38	100.76	100.82	100.65	99.40	100.21	100.65	98.87
Cations based on 4 oxygens													
Si	0.99	1.00	0.99	0.99	1.00	0.99	0.99	1.00	0.99	1.00	0.99	0.99	1.00
Cr	0 00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fe	0.48	0.47	0.47	0.47	0.47	0.48	0.48	0.48	0.47	0.46	0.47	0.49	0.46
Mg	1.52	1.53	1.53	1.53	1.51	1.53	1.53	1.52	1.53	1.53	1.53	1.52	1.53
Mn	0 01	0 01	0 01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Ca	0.01	0.00	0.00	0 00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01
Ni	0.00	0.01	0.01	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Fo	76 07	76.55	76 29	76.21	76.30	76.07	76.08	76.03	76.27	76.84	76.61	75.44	76.87
Fa	23 76	23 37	23.56	23.64	23.59	23.81	23.83	23.83	23.61	23.08	23.29	24.33	23.06

EXAMPLE

Table 9. Composition of olivine phenocrysts from LW135FVP of Qs2fs

lw135_4a	lw135_4a	lw135_4a	lw135_4a	lw135_4a	lw135_4a	lw135_4a	lw135_4a	lw135_4a	lw135_4ae	lw135_5b	lw135_5	lw135_5
38.39	38.26	38.73	38.92	38.65	38.27	38.09	38.01	38.13	38.31	38.52	38.63	38.36
0.01	0.01	0.02	0.02	0.00	0.00	0.14	0.02	0.01	0.02	0.00	0.00	0.01
20.69	20.52	20.88	20.83	20.85	20.69	21.34	20.72	20.86	21.14	20.53	20.64	20.51
39.96	39.89	39.95	40.13	40.01	38.92	39.87	40.09	39.91	39.33	40.14	40.05	39.97
0.27	0.32	0.28	0.24	0.24	0.22	0.22	0.31	0.27	0.28	0.22	0.30	0.26
0.17	0.14	0.13	0.13	0.15	0.15	0.14	0.13	0.17	0.17	0.16	0.15	0.16
0.22	0.17	0.24	0.20	0.17	0.26	0.19	0.23	0.18	0.11	0.19	0.20	0.19
99.70	99.30	100.24	100.48	100.07	98.50	99.99	99.52	99.53	99.34	99.76	99.97	99.46
1.00	1.00	1.00	1.00	1.00	1.01	0.99	0.99	0.99	1.00	1.00	1.00	1.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.45	0.45	0.45	0.45	0.45	0.45	0.46	0.45	0.45	0.46	0.44	0.45	0.45
1.55	1.55	1.54	1.54	1.54	1.52	1.54	1.56	1.55	1.53	1.55	1.54	1.55
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00
0.01	0.00	0.01	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00
77.44	77.49	77.22	77.39	77.33	77.00	76.87	77.40	77.28	76.77	77.68	77.48	77.59
22.50	22.36	22.65	22.54	22.61	22.97	23.09	22.45	22.67	23.16	22.29	22.40	22.34

Table 9. Composition of olivine phenocrysts from LW135FVP of Qs2fs

lw135_5	lw135_5	lw135_5	lw135_5	lw135_5	lw135_5	lw135_5	lw135_5	lw135_5e
38.40	38.46	38.48	38.46	38.50	38.30	38.63	38.42	38.39
0.00	0.01	0.01	0.02	0.04	0.00	0.00	0.00	0.01
20.24	20.33	20.56	20.12	20.57	20.37	20.26	20.57	20.20
40.14	39.96	40.01	40.00	39.96	39.91	39.81	39.95	39.59
0.25	0.25	0.23	0.21	0.27	0.28	0.28	0.24	0.24
0.14	0.15	0.16	0.16	0.14	0.17	0.14	0.18	0.16
0.22	0.18	0.23	0.24	0.12	0.23	0.27	0.24	0.14
99.39	99.34	99.69	99.21	99.61	99.26	99.39	99.60	98.73
1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.44	0.44	0.45	0.44	0.45	0.44	0.44	0.44	0.44
1.55	1.55	1.55	1.55	1.54	1.55	1.54	1.55	1.54
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.01	0.00
0.01	0.00	0.01	0.01	0.00	0.01	0.01	0.01	0.00
77.89	77.73	77.60	77.99	77.51	77.69	77.70	77.57	77.70
22.04	22.19	22.37	22.01	22.39	22.24	22.19	22.41	22.25

EXAMPLE

Table 10. Composition of olivine phenocrysts from LW61FVP of Q13

Point	lw61fvp_#1a	lw61fvp_#1b	lw61fvp_#1c	lw61fvp_#1d	lw61fvp_#1e	lw61fvp_#1f	lw61fvp_#1g	lw61fvp_#2a	lw61fvp_#2b	lw61fvp_#2c
SiO_2	37.13	38.13	38.11	38.07	38.35	36.97	36.96	37.15	38.10	38.18
MgO	36.62	40.85	40.97	40.91	40.88	36.08	35.66	36.44	41.14	41.02
FeO	25.00	20.27	20.33	20.14	20.22	26.33	26.51	25.44	20.30	20.33
CaO	0.17	0.11	0.14	0.13	0.12	0.23	0.28	0.22	0.11	0.14
MnO	0.41	0.28	0.25	0.32	0.26	0.40	0.42	0.43	0.27	0.29
NiO	0.09	0.21	0.21	0.24	0.25	0.10	0.11	0.09	0.22	0.20
TOTAL	99.42	99.86	100.00	99.81	100.07	100.11	99.93	99.77	100.14	100.15
Cations based on 4 oxygens										
Si	0.99	0.99	0.99	0.99	0.99	0.98	0.99	0.99	0.98	0.99
Mg	1.45	1.58	1.58	1.58	1.57	1.43	1.42	1.44	1.58	1.58
Fe	0.56	0.44	0.44	0.44	0.44	0.59	0.59	0.57	0.44	0.44
Ca	0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00
Mn	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Ni	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.01	0.00
Fo	72.15	78.11	78.17	78.22	78.19	70.86	70.51	71.74	78.20	78.14
Fa	27.64	21.75	21.76	21.61	21.70	29.01	29.42	28.11	21.66	21.73

EXAMPLE

Table 10. Composition of olivine phenocrysts from LW61FVP of Q13

lw61fvp_#2d	lw61fvp_#2e	lw61fvp_#2f	lw61fvp_#2g	lw61fvp_#2h	lw61fvp_#2i	lw61fvp_#2j	lw61fvp_#2k	lw61fvp_#3a	lw61fvp_#3b	lw61fvp_#3c
38.39	38.24	37.67	38.15	38.17	38.12	38.17	37.04	37.43	38.23	38.17
40.80	40.53	38.04	40.95	40.99	40.79	40.32	36.09	36.11	40.60	40.98
20.30	21.23	23.36	20.33	20.59	20.56	21.09	25.79	25.98	20.84	20.74
0.16	0.14	0.18	0.13	0.13	0.13	0.12	0.24	0.24	0.16	0.13
0.31	0.29	0.36	0.26	0.27	0.24	0.28	0.41	0.39	0.27	0.25
0.30	0.23	0.13	0.28	0.22	0.28	0.24	0.11	0.13	0.20	0.21
100.26	100.66	99.74	100.10	100.37	100.11	100.22	99.67	100.27	100.31	100.48
0.99	0.99	0.99	0.99	0.98	0.99	0.99	0.99	0.99	0.99	0.98
1.57	1.56	1.49	1.58	1.58	1.57	1.55	1.43	1.43	1.56	1.57
0.44	0.46	0.51	0.44	0.44	0.44	0.46	0.58	0.58	0.45	0.45
0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.00	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00
78.09	77.20	74.27	78.13	77.93	77.89	77.21	71.30	71.17	77.58	77.82
21.90	22.69	25.59	21.76	21.96	22.03	22.66	28.59	28.73	22.35	22.10

Table 10. Composition of olivine phenocrysts from LW61FVP of Ql3

lw61fvp_#3d	lw61fvp_#3e	lw61fvp_#4a	lw61fvp_#4b	lw61fvp_#4c	lw61fvp_#4d	lw61fvp_#4e	lw61fvp_#4f	lw61fvp_#4g	lw61fvp_#4h	lw61fvp_#4i
38.00	37.10	37.00	38.04	38.19	38.04	37.38	37.25	38.19	38.14	37.43
40.23	35.91	36.21	40.70	40.71	40.68	37.82	36.80	40.60	40.55	37.28
21.53	26.44	26.46	20.80	20.96	20.81	23.76	25.24	20.89	20.96	24.87
0.15	0.23	0.25	0.14	0.15	0.12	0.17	0.21	0.18	0.14	0.18
0.27	0.39	0.43	0.33	0.25	0.31	0.31	0.43	0.29	0.26	0.36
0.22	0.09	0.06	0.22	0.19	0.25	0.18	0.08	0.23	0.20	0.24
100.40	100.16	100.40	100.23	100.44	100.20	99.62	100.00	100.36	100.24	100.35
0.98	0.99	0.98	0.98	0.99	0.98	0.99	0.99	0.99	0.99	0.99
1.55	1.42	1.43	1.57	1.57	1.57	1.49	1.45	1.56	1.56	1.46
0.47	0.59	0.59	0.45	0.45	0.45	0.52	0.56	0.45	0.45	0.55
0.00	0.01	0.01	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.01
76.84	70.69	70.83	77.58	77.53	77.57	73.86	72.08	77.55	77.45	72.66
23.07	29.20	29.04	22.25	22.40	22.26	26.03	27.74	22.39	22.46	27.20

EXAMPLE

Table 10. Composition of olivine phenocrysts from LW61FVP of Ql3

lw61fvp_#4j	lw61fvp_#4k	lw61fvp_#4l	lw61fvp_#4m	lw61fvp_#4n	lw61fvp_#5a	lw61fvp_#5b	lw61fvp_#5c	lw61fvp_#5d	lw61fvp_#5e	lw61fvp_#5f
37.93	36.91	37.90	38.24	37.24	36.71	37.93	38.26	37.52	36.47	36.49
40.13	34.82	39.86	40.46	35.69	34.71	39.79	40.36	37.40	34.95	35.40
21.11	27.21	21.73	20.56	26.22	27.34	21.50	21.17	24.33	27.20	26.86
0.21	0.28	0.15	0.12	0.26	0.32	0.15	0.14	0.19	0.28	0.26
0.21	0.47	0.32	0.24	0.37	0.48	0.29	0.32	0.34	0.46	0.41
0.20	0.07	0.15	0.15	0.09	0.07	0.23	0.19	0.18	0.05	0.01
99.79	99.75	100.12	99.77	99.87	99.63	99.89	100.42	99.97	99.41	99.43
0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.98	0.98
1.56	1.39	1.54	1.56	1.42	1.39	1.54	1.55	1.47	1.40	1.42
0.46	0.61	0.47	0.45	0.58	0.61	0.47	0.46	0.54	0.61	0.60
0.01	0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
77.27	69.43	76.47	77.75	70.78	69.29	76.64	77.14	73.17	69.52	70.08
22.80	30.44	23.39	22.16	29.18	30.62	23.24	22.70	26.71	30.36	29.83

Table 10. Composition of olivine phenocrysts from LW61FVP of Q13

lw61fvp_#5g	lw61fvp_#5h	lw61fvp_#5i	lw61fvp_#5j
38.04	38.09	38.16	36.84
41.27	41.03	39.91	36.25
20.11	20.23	21.43	26.26
0.13	0.10	0.16	0.20
0.26	0.23	0.29	0.38
0.20	0.28	0.14	0.11
100.01	99.96	100.08	100.05
0.98	0.98	0.99	0.98
1.59	1.58	1.54	1.44
0.43	0.44	0.47	0.58
0.00	0.00	0.00	0.01
0.01	0.01	0.01	0.01
0.00	0.01	0.00	0.00
78.45	78.25	76.77	71.01
21.45	21.65	23.13	28.86

EXAMPLE

Table 11. Composition of olivine phenocrysts from LW80FVP of Qs3

Point	lw80fvp_rim_#1a	lw80fvp_core_#1f	lw80fvp_core_#1e	lw80fvp_rim_#1d	lw80fvp_rim_#1c	lw80fvp_rim_#2a	lw80fvp_core_#2e
SiO_2	37.61	38.46	38.26	38.32	38.22	38.58	38.25
MgO	39.72	40.46	40.44	40.22	40.63	40.29	40.08
FeO	21.45	20.92	20.93	20.72	21.09	20.82	21.92
CaO	0.16	0.16	0.15	0.15	0.16	0.16	0.13
MnO	0.30	0.33	0.29	0.27	0.27	0.31	0.33
NiO	0.07	0.22	0.25	0.14	0.21	0.14	0.20
TOTAL	99.31	100.54	100.32	99.82	100.58	100.29	100.91
Cations based on 4 oxygens							
Si	0.98	0.99	0.99	0.99	0.99	1.00	0.99
Mg	1.55	1.55	1.56	1.55	1.56	1.55	1.54
Fe	0.47	0.45	0.45	0.45	0.46	0.45	0.47
Ca	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mn	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Ni	0.00	0.01	0.01	0.00	0.00	0.00	0.00
Fo	76.66	77.40	77.41	77.51	77.38	77.43	76.39
Fa	23.22	22.45	22.48	22.41	22.54	22.45	23.44

EXAMPLE

Table 11. Composition of olivine phenocrysts from LW80FVP of Qs3

lw80fvp_core_#2d	lw80fvp_rim_#2b	lw80fvp_rim_#2f	lw80fvp_core_#2h	lw80fvp_core_#2i	lw80fvp rim_#2g	lw80fvp_rim_#3a	lw80fvp_core_#3g
37.27	37.57	37.89	37.75	37.52	37.91	37.96	38.45
40.16	40.40	40.25	39.68	39.34	39.63	40.66	41.02
21.13	21.10	21.26	22.14	22.24	21.59	21.03	20.11
0.15	0.17	0.14	0.13	0.13	0.14	0.14	0.11
0.26	0.27	0.29	0.35	0.29	0.28	0.30	0.27
0.13	0.18	0.20	0.14	0.15	0.16	0.20	0.23
99.08	99.69	100.02	100.19	99.67	99.70	100.30	100.19
0.98	0.98	0.98	0.98	0.98	0.99	0.98	0.99
1.57	1.57	1.56	1.54	1.54	1.54	1.57	1.57
0.46	0.46	0.46	0.48	0.49	0.47	0.46	0.43
0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
77.15	77.29	77.05	76.01	75.82	76.50	77.40	78.31
22.78	22.65	22.83	23.79	24.04	23.38	22.47	21.54

Table 11. Composition of olivine phenocrysts from LW80FVP of Qs3

lw80fvp_core_#3e	lw80fvp_rim_#3d	lw80fvp_rim_#3c	lw80fvp_rim_#4a	lw80fvp_core_#4d	lw80fvp_core_#4c	lw80fvp_rim_#4b	lw80fvp_rim_#5b
37.89	38.54	37.76	37.45	38.19	38.32	37.81	37.47
40.72	40.62	40.29	40.17	40.91	40.98	40.90	39.85
20.44	20.82	21.03	21.16	20.44	20.45	20.37	21.26
0.14	0.16	0.14	0.17	0.11	0.13	0.12	0.17
0.25	0.29	0.29	0.30	0.23	0.24	0.28	0.29
0.24	0.14	0.13	0.17	0.22	0.22	0.21	0.16
99.68	100.57	99.63	99.42	100.10	100.35	99.69	99.20
0.98	0.99	0.98	0.98	0.99	0.99	0.98	0.98
1.58	1.56	1.56	1.57	1.57	1.57	1.58	1.56
0.44	0.45	0.46	0.46	0.44	0.44	0.44	0.47
0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.00
77.95	77.59	77.25	77.11	78.03	78.07	78.06	76.90
21.96	22.31	22.62	22.79	21.87	21.85	21.81	23.02

EXAMPLE

Table 11. Composition of olivine phenocrysts from LW80FVP of Qs3

lw80fvp_core_#5d	lw80fvp_core_#5e	lw80fvp_rim_#5a	lw80fvp_rim_#5c
38.33	38.24	37.64	38.57
41.20	40.79	40.29	40.48
20.00	20.36	21.32	20.89
0.13	0.11	0.14	0.14
0.19	0.28	0.30	0.30
0.24	0.23	0.15	0.15
100.08	100.01	99.84	100.53
0.99	0.99	0.98	0.99
1.58	1.57	1.56	1.55
0.43	0.44	0.46	0.45
0.00	0.00	0.00	0.00
0.00	0.01	0.01	0.01
0.01	0.01	0.00	0.00
78.57	78.00	77.01	77.45
21.40	21.85	22.86	22.42

Table 12. Composition of olivine phenocrysts from LW78FVP of Qs4b

TAG	lw78fvp_rim_#1b	lw78fvp_core_#1c	lw78fvp_core_#1d	lw78fvp_rim_#1a	lw78fvp_rim_#2a	lw78fvp_rim_#2c	lw78fvp_core_#2d
SiO_2	37.86	38.10	37.98	38.03	37.96	37.96	37.92
MgO	39.78	40.45	40.86	40.37	40.26	39.89	40.30
FeO	20.81	20.24	20.44	20.26	20.28	20.99	20.33
CaO	0.14	0.15	0.13	0.15	0.15	0.16	0.15
MnO	0.28	0.29	0.22	0.24	0.22	0.27	0.23
NiO	0.15	0.26	0.24	0.14	0.16	0.15	0.16
TOTAL	99.03	99.49	99.86	99.19	99.03	99.42	99.08
Cations based on 4 oxygens							
Si	0.99	0.99	0.98	0.99	0.99	0.99	0.99
Mg	1.55	1.57	1.58	1.57	1.57	1.55	1.57
Fe	0.46	0.44	0.44	0.44	0.44	0.46	0.44
Ca	0.00	0.00	0.00	0.00	0.00	0.01	0.00
Mn	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Ni	0.00	0.01	0.01	0.00	0.00	0.00	0.00
Fo	77.22	78.00	78.04	77.99	77.95	77.15	77.91
Fa	22.67	21.89	21.90	21.95	[illegible]	22.78	22.05

EXAMPLE

Table 12. Composition of olivine phenocrysts from LW78FVP of Qs4b

lw78fvp_core_#2f	lw78fvp_core_#2e	lw78fvp_rim_#2b	lw78fvp_rim_#3f	lw78fvp_#3g	lw78fvp_#3h	lw78fvp_#3i	lw78fvp_rim_#3j	lw78fvp_rim_#3k
37.79	39.07	37.58	37.04	37.01	38.34	37.60	37.33	37.39
40.90	41.80	39.49	39.42	39.74	40.80	40.27	39.50	39.68
20.60	21.03	21.34	21.48	21.38	20.57	20.66	21.26	21.29
0.14	0.14	0.21	0.19	0.18	0.13	0.13	0.18	0.17
0.24	0.24	0.25	0.22	0.27	0.25	0.27	0.27	0.27
0.23	0.32	0.14	0.11	0.06	0.18	0.26	0.11	0.28
99.90	102.61	99.00	98.46	98.64	100.26	99.19	98.65	99.09
0.98	0.99	0.99	0.98	0.98	0.99	0.98	0.98	0.98
1.58	1.57	1.55	1.55	1.56	1.57	1.57	1.55	1.55
0.45	0.44	0.47	0.48	0.47	0.44	0.45	0.47	0.47
0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.01
77.91	77.94	76.76	76.60	76.79	77.88	77.56	76.78	76.81
22.01	22.00	23.27	23.42	23.18	22.03	22.33	23.18	23.13

Table 12. Composition of olivine phenocrysts from LW78FVP of Qs4b

lw78fvp_rim_#3l	lw78fvp_rim_#4a	lw78fvp_rim_#4b	lw78fvp_core_#4f	lw78 vp_core_#4d	lw78fvp_core_#4h	lw78fvp_rim_#4c	lw78fvp_rim_#5a
37.27	36.82	38.04	38.94	38.04	37.71	37.69	37.59
39.39	39.96	40.29	41.60	40.62	40.74	40.18	39.89
21.82	20.83	20.58	20.80	20.11	20.25	20.93	21.22
0.18	0.16	0.14	0.15	0.15	0.13	0.16	0.16
0.27	0.26	0.30	0.22	0.27	0.26	0.22	0.29
0.09	0.20	0.21	0.30	0.28	0.20	0.12	0.11
99.01	98.22	99.56	102.01	99.46	99.30	99.29	99.25
0.98	0.97	0.99	0.99	0.99	0.98	0.98	0.98
1.55	1.58	1.56	1.57	1.57	1.58	1.56	1.56
0.48	0.46	0.45	0.44	0.44	0.44	0.46	0.46
0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00
76.25	77.32	77.62	78.07	78.19	78.12	77.37	76.94
23.70	22.61	22.24	21.90	21.72	21.78	22.61	22.96

EXAMPLE

Table 12. Composition of olivine phenocrysts from LW78FVP of Qs4b

lw78fvp_rim_#5c	lw78fvp_core_#5e	lw78fvp_core_#5d	lw78fvp_core_#5f	lw78fvp_rim_#5b
38.20	38.22	38.26	38.18	37.93
40.18	40.76	40.52	40.88	40.36
21.08	20.33	20.71	20.45	21.11
0.16	0.09	0.14	0.10	0.15
0.33	0.27	0.28	0.33	0.22
0.20	0.26	0.25	0.29	0.21
100.14	99.92	100.16	100.24	99.96
0.99	0.99	0.99	0.99	0.98
1.55	1.57	1.56	1.57	1.56
0.46	0.44	0.45	0.44	0.46
0.00	0.00	0.00	0.00	0.00
0.01	0.01	0.01	0.01	0.01
0.00	0.01	0.01	0.01	0.00
77.15	78.00	77.63	77.92	77.28
22.71	21.83	22.26	21.87	22.68

Table 13. Compositions of olivine phenocrysts from LW151FVP of Qs4a

Point	lw151fvp#1b	lw151fvp#1	lw151fvp#1	lw151fvp#1	lw151fvp#1	lw151fvp#1	lw151fvp#1e	lw151fvp#2b	lw151fvp#2	lw151fvp#2
SiO_2	38.14	37.94	37.87	37.69	38.06	37.83	38.42	38.05	38.60	38.22
MgO	40.52	40.37	39.89	39.62	40.02	40.70	40.59	39.54	40.50	40.79
FeO	20.41	20.27	20.78	21.22	21.25	20.42	20.38	21.88	20.99	20.42
CaO	0.13	0.14	0.15	0.12	0.14	0.13	0.13	0.18	0.18	0.12
MnO	0.16	0.35	0.22	0.24	0.27	0.23	0.18	0.34	0.24	0.26
NiO	0.24	0.22	0.09	0.24	0.15	0.25	0.27	0.09	0.21	0.20
TOTAL	99.60	99.27	99.00	99.14	99.88	99.57	99.98	100.07	100.71	100.01
Cations based on 4 oxygens										
Si	0.99	0.99	0.99	0.99	0.99	0.98	0.99	0.99	0.99	0.99
Mg	1.57	1.57	1.55	1.55	1.55	1.58	1.56	1.53	1.55	1.57
Fe	0.44	0.44	0.45	0.47	0.46	0.44	0.44	0.48	0.45	0.44
Ca	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00
Mn	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.01
Ni	0.01	0.00	0.00	0.01	0.00	0.01	0.01	0.00	0.00	0.00
Fo	77.96	77.86	77.36	76.82	76.97	77.97	78.01	76.22	77.46	77.98
Fa	22.03	21.94	22.61	23.08	22.93	21.95	21.98	23.67	22.52	21.91

EXAMPLE

Table 13. Compositions of olivine phenocrysts from LW151FVP of Qs4a

lw151fvp#2	lw151fvp#2	lw151fvp#2	lw151fvp#2e	lw151fvp#3b	lw151fvp#3	lw151fvp#3	lw151fvp#3	lw151fvp#3	lw151fvp#3	lw151fvp#3e
38.17	38.65	38.06	38.26	38.32	38.13	38.32	38.14	38.46	39.04	38.34
40.74	40.59	40.83	39.87	39.44	39.66	40.20	39.43	38.50	38.54	39.62
20.40	20.62	20.54	21.12	21.47	21.04	21.09	21.56	21.63	21.41	20.49
0.12	0.15	0.15	0.18	0.15	0.19	0.15	0.13	0.15	0.14	0.14
0.21	0.20	0.29	0.37	0.23	0.32	0.30	0.32	0.30	0.34	0.29
0.24	0.30	0.23	0.18	0.14	0.15	0.13	0.19	0.18	0.13	0.22
99.87	100.51	100.09	99.98	99.75	99.48	100.19	99.77	99.22	99.60	99.10
0.99	0.99	0.98	0.99	1.00	0.99	0.99	0.99	1.01	1.01	1.00
1.57	1.56	1.57	1.54	1.53	1.54	1.55	1.53	1.50	1.49	1.54
0.44	0.44	0.44	0.46	0.47	0.46	0.46	0.47	0.47	0.47	0.45
0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00
0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
78.02	77.82	77.91	76.97	76.57	77.01	77.16	76.40	75.95	76.60	77.41
21.92	22.17	21.99	22.88	23.39	22.92	22.72	23.43	23.93	23.72	22.47

Table 13. Compositions of olivine phenocrysts from LW151FVP of Qs4a

lw151fvp#4b	lw151fvp#4	lw151fvp#4	lw151fvp#4e	lw151fvp#5b	lw151fvp#5	lw[illegible]fvp#5	lw151fvp#5e
37.84	37.92	37.94	37.95	38.86	38.66	[illegible]	38.77
40.59	40.80	40.77	40.67	40.50	40.83	40.8[illegible]	41.23
19.93	20.27	20.43	20.48	20.54	20.33	2[illegible]	20.19
0.12	0.12	0.15	0.14	0.17	0.16	0.14	0.13
0.21	0.24	0.20	0.27	0.29	0.22	0.30	0.21
0.29	0.24	0.29	0.23	0.28	0.22	0.30	0.32
98.96	99.60	99.78	99.74	100.65	100.41	100.83	100.86
0.99	0.98	0.98	0.98	1.00	0.99	1.00	0.99
1.58	1.58	1.58	1.57	1.55	1.56	1.56	1.57
0.44	0.44	0.44	0.44	0.44	0.44	0.44	0.43
0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
0.01	0.01	0.00	0.01	0.01	0.01	0.01	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
78.35	78.13	78.05	77.90	77.78	78.14	78.02	78.41
21.58	21.78	21.94	22.01	22.14	21.83	21.85	21.54

EXAMPLE

Table 14. Composition of plagioclase phenocryst[illegible] nd groundmass (gm) from LW21FVP of Ql1d

Point	lw21_#3b	lw21_#3	lw21_#3	lw21_#3e	lw21_#7b	lw21_#7	lw21_#7	lw21_#7e	lw21_#10b	lw21_#10	lw21_#10	lw21_#10	lw21_#10e
SiO_2	[illegible]	49.45	49.88	50.60	51.98	51.07	48.69	50.37	49.49	49.05	49.50	50.11	50.55
Al_2O_3	29.09	30.[illegible]	30.49	29.59	29.79	30.65	29.36	29.67	30.07	30.20	30.06	30.28	30.01
FeO	0.82	0.69	0.83	0.79	0.76	0.73	0.73	0.81	0.82	0.67	0.68	0.74	0.87
CaO	12.63	14.04	14.10	12.99	12.67	13.52	14.57	13.13	13.72	13.83	13.66	13.86	13.36
Na_2O	4.21	3.40	3.56	4.04	4.38	3.79	3.63	3.79	3.57	3.55	3.58	3.52	3.76
K_2O	0.32	0.21	0.22	0.31	0.36	0.23	0.26	0.29	0.25	0.24	0.23	0.23	0.27
SrO	0.33	0.32	0.39	0.31	0.29	0.33	0.32	0.35	0.42	0.34	0.27	0.30	0.39
BaO	0.11	0.01	0.11	0.11	0.08	0.06	0.08	0.07	0.06	0.06	0.03	0.07	0.13
TOTAL	98.55	98.72	99.57	98.73	100.30	100.39	97.64	98.48	98.40	97.95	98.01	99.11	99.33
Cations based on 8 oxygens													
Si	2.37	2.30	2.30	2.35	2.37	2.33	2.30	2.34	2.31	2.30	2.31	2.32	2.33
Al	1.59	1.68	1.66	1.62	1.60	1.65	1.63	1.63	1.65	1.67	1.66	1.65	1.63
Fe	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Ca	0.63	0.70	0.70	0.65	0.62	0.66	0.74	0.65	0.69	0.70	0.68	0.69	0.66
Na	0.38	0.31	0.32	0.36	0.39	0.34	0.33	0.34	0.32	0.32	0.32	0.32	0.34
K	0.02	0.01	0.01	0.02	0.02	0.01	0.02	0.02	0.02	0.02	0.01	0.01	0.02
Sr	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
[illegible]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Or	1.87	1.24	1.26	1.78	2.03	1.35	1.42	1.68	1.44	1.41	1.36	1.32	1.55
Ab	36.86	30.07	30.89	35.33	37.63	33.17	30.58	33.65	31.55	31.23	31.7[illegible]	31.04	33.14
An	61.08	68.67	67.66	62.71	60.19	65.37	67.86	64.53	66.90	67.25	66.9	67.51	65.08

EXAMPL

Table 14. Compo ition of plagioclase phenocrysts and groundmass (gm) from LW21FVP of Ql1d

lw21_#11ab	lw21_#11a	lw21_#11ae	lw21_#11bb	lw21_#11b	lw21_#11b	lw21_#11b	lw21_#11be	lw21_#12ab	lw21_#12a	lw21_#12a	lw21_#12a
57.42	50.44	49.76	49.33	49 84	50.35	50.33	50.55	48.34	48.24	48.70	48.29
23 69	29.92	29.44	29.21	30.06	29.96	29.74	29.55	29.21	30.33	30.40	30.30
0.62	0.73	0.80	0.74	0 66	0.58	0.66	0.76	0.93	0.71	0.70	0 78
6 65	13.57	13.01	13.77	13.77	13.49	13.60	12.79	13.69	13.63	13 68	13 92
5.87	3.64	4.02	3.80	3.62	3.64	3.64	4.11	3.79	3.57	3.52	3.52
3.24	0.26	0.32	0.29	0.23	0.23	0.25	0.32	0.32	0.24	0.22	0.26
0.11	0.37	0.29	0.31	0.27	0.37	0.29	0.31	0.31	0.34	0.24	0.31
0 28	0.12	0.10	0.07	0.04	0.07	0.07	0.00	0.04	0.08	0.02	0.08
97.89	99.04	97.73	97.52	98.49	98.68	98.56	98.39	96 63	97.14	97.47	97.46
2.67	2 33	2.34	2.33	2.32	2.34	2.34	2.35	2.30	2.28	2.29	2.28
1 30	1 63	1 63	1.62	1.65	1.64	1.63	1.62	1.64	1.69	1.69	1.69
0 02	0.03	0.03	0.03	0.03	0.02	0.03	0.03	0.04	0.03	0.03	0.03
0 33	0.67	0.65	0.70	0.69	0.67	0.68	0.64	0.70	0.69	0.69	0.70
0 53	0 33	0.37	0.35	0.33	0.33	0.33	0.37	0.35	0.33	0.32	0.32
0.19	0.02	0.02	0.02	0.01	0.01	0.02	0.02	0.02	0.02	0.01	0.02
0.00	0 01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0 01	0.01
0 01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0 00	0.00	0.00
18 15	1.50	1.82	1.63	1.35	1.35	1.43	1.82	1.80	1.43	1.30	1.49
50.04	32.09	35.15	32.74	31.78	32.31	32.11	36.08	32.72	31.66	31.32	30.87
31 33	66 20	62.85	65.51	66.82	66.23	66.33	62.09	65.40	66.77	67.35	67.49

Table 14. Composition of plagioclase phenocrysts and groundmass (gm) from LW21FVP of Qf1d

lw21_#12ae	lw21_#12bb	lw21_#12b	lw21_#12b	lw21_#12be	lw21_#13b	lw21_#13	lw21_#13	lw21_#13e	lw21_#14ab	lw21_#14a	lw21_#14a
					gm	gm	gm	gm	gm	gm	gm
50.84	50.36	48.67	49.07	50.23	48.57	48.40	48.86	56.04	52.30	48.22	47.90
29.77	30.22	30.07	30.37	29.12	29.65	29.97	29.63	25.34	28.86	29.94	29.94
0.81	0.77	0.65	0.68	0.81	0.77	0.70	0.74	0.71	0.86	0.78	0.73
12.96	13.69	14.32	13.93	12.42	13.29	13.51	13.41	7.76	11.89	13.71	13.85
3.89	3.59	3.47	3.59	4.25	3.64	3.69	3.65	6.42	4.64	3.66	3.62
0.30	0.25	0.24	0.24	0.38	0.27	0.24	0.32	1.01	0.39	0.24	0.23
0.33	0.36	0.31	0.38	0.34	0.46	0.33	0.33	0.24	0.35	0.36	0.33
0.08	0.07	0.05	0.07	0.11	0.08	0.05	0.10	0.41	0.12	0.04	0.02
98.99	99.31	97.77	98.31	97.67	96.72	96.88	97.03	97.93	99.40	96.95	96.62
2.35	2.32	2.29	2.29	2.36	2.31	2.29	2.31	2.59	2.40	2.29	2.28
1.62	1.64	1.67	1.67	1.61	1.66	1.67	1.65	1.38	1.56	1.67	1.68
0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
0.64	0.68	0.72	0.70	0.62	0.68	0.69	0.68	0.39	0.59	0.70	0.71
0.35	0.32	0.32	0.33	0.39	0.34	0.34	0.34	0.58	0.41	0.34	0.33
0.02	0.02	0.01	0.01	0.02	0.02	0.02	0.02	0.06	0.02	0.02	0.01
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
1.75	1.45	1.36	1.36	2.22	1.57	1.42	1.85	5.80	2.23	1.39	1.32
34.54	31.70	30.04	31.34	37.32	32.57	32.56	32.36	56.03	40.40	32.10	31.68
63.57	66.72	68.52	67.18	60.26	65.71	65.93	65.61	37.44	57.17	66.44	66.96

EXAMPLE

Table 14. Composition of plagioclase phenocrysts and groundmass (gm) from LW21FVP of Ql1d

lw21_#14ab	lw21_#14bb	lw21_#14b	lw21_#14be
gm	gm	gm	gm
48.51	55.29	49.17	49.41
30.20	21.49	29.45	29.14
0.67	3.45	0.90	0.88
13.79	9.08	13.19	12.53
3.58	4.85	3.94	4.08
0.24	2.07	[illegible]	0.37
0.34	0.08	0.34	0.36
0.10	0.17	0.06	0.11
97.42	96.49	97.37	96.89
2.29	2.64	2.32	2.34
1.63	1.21	1.64	1.63
0.03	[illegible]	0.04	0.04
0.70	0.47	0.67	0.64
0.33	0.45	0.36	0.38
0.01	0.13	0.02	0.02
0.01	0.00	0.01	0.01
0.00	0.00	0.00	0.00
1.37	12.10	1.90	2.18
31.44	43.06	34.41	36.19
67.02	44.53	63.60	61.44

Table 15. Composition of plagioclase phenocrysts and groundmass (gm) from LW73FVP of Ql1b

Point	LW73ph1b	LW73ph1	LW73ph1	LW73ph1	LW73ph1	LW73ph1	LW73ph1e	LW73ph2b	LW73ph2	LW73ph2	LW73ph2	LW73ph2e
SiO_2	50.65	50.53	51.10	50.42	50.50	50.30	51.28	51.06	51.15	51.24	51.49	52.13
Al_2O_3	30.55	30.68	30.39	30.98	30.48	30.07	29.90	30.43	30.91	30.35	30.70	29.70
FeO	0.69	0.61	0.71	0.62	0.64	0.59	0.81	0.76	0.68	0.67	0.69	0.87
CaO	13.64	13.70	13.55	13.71	13.80	13.32	13.13	13.76	13.72	13.51	13.55	12.80
Na_2O	3.43	3.50	3.59	3.38	3.43	3.55	3.77	3.51	3.52	3.50	3.58	3.86
K_2O	0.30	0.25	0.32	0.23	0.23	0.28	0.35	0.26	0.21	0.22	0.24	0.35
SrO	0.34	0.21	0.22	0.35	0.33	0.35	0.42	0.24	0.29	0.33	0.34	0.28
BaO	0.07	0.09	0.08	0.05	0.08	0.12	0.13	0.12	0.07	0.07	0.06	0.10
TOTAL	99.67	99.57	99.97	99.75	99.48	98.57	99.78	100.13	100.54	99.89	100.64	100.09
Cations based on 8 oxygens												
Si	2.33	2.32	2.34	2.31	2.32	2.33	2.35	2.33	2.33	2.34	2.34	2.38
Al	1.65	1.66	1.64	1.67	1.65	1.65	1.62	1.64	1.66	1.64	1.64	1.60
Fe	0.03	0.02	0.03	0.02	0.03	0.02	0.03	0.03	0.03	0.03	0.03	0.03
Ca	0.67	0.67	0.66	0.67	0.68	0.66	0.65	0.67	0.67	0.66	0.66	0.63
Na	0.31	0.31	0.32	0.30	0.31	0.32	0.34	0.31	0.31	0.31	0.32	0.34
K	0.02	0.02	0.02	0.01	0.01	0.02	0.02	0.02	0.01	0.01	0.01	0.02
Sr	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Ba	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Or	1.76	1.48	1.87	1.36	1.34	1.63	2.05	1.50	1.25	1.30	1.41	2.07
Ab	30.71	31.07	31.76	30.40	30.55	31.91	33.42	31.04	31.29	31.45	31.85	34.49
An	67.40	67.28	66.22	68.15	67.97	66.24	64.31	67.24	67.34	67.13	66.63	63.25

EXAMPLE

Table 15. Composition of plagioclase phenocrysts and groundmass (gm) from LW73FVP of Ql1b

LW73ph4b	LW73ph4	LW73ph4	LW73ph4	LW73ph4	LW73ph4	LW73ph4e	LW73ph1_gm1 gm	LW73ph1_gm1 gm	LW73ph1_gm2 gm	LW73ph1_gm2 gm
49.46	50.34	49.27	48.85	49.51	49.92	49.83	53.54	52.47	54.47	51.33
31.00	30.99	31.06	30.68	30.88	30.80	30.50	28.70	29.73	27.60	29.89
0.72	0.68	0.70	0.69	0.67	0.71	0.66	0.90	1.00	0.86	0.85
13.57	13.88	14.04	13.69	13.74	13.57	13.54	11.64	12.38	10.18	12.87
3.43	3.46	3.34	3.29	3.46	3.53	3.47	4.53	4.06	4.97	3.84
0.27	0.26	0.19	0.20	0.21	0.26	0.27	0.49	0.45	1.05	0.36
0.26	0.27	0.30	0.28	0.32	0.26	0.32	0.22	0.28	0.22	0.36
0.06	0.00	0.03	0.00	0.05	0.05	0.06	0.08	0.10	0.31	0.07
98.77	99.87	98.93	97.67	98.83	99.09	98.64	100.10	100.47	99.67	99.56
2.29	2.31	2.28	2.29	2.30	2.31	2.31	2.44	2.39	2.49	2.36
1.69	1.67	1.70	1.70	1.69	1.68	1.67	1.54	1.59	1.49	1.62
0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.03	0.03
0.67	0.68	0.70	0.69	0.68	0.67	0.67	0.57	0.60	0.50	0.63
0.31	0.31	0.30	0.30	0.31	0.32	0.31	0.40	0.36	0.44	0.34
0.02	0.02	0.01	0.01	0.01	0.02	0.02	0.03	0.03	0.06	0.02
0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
1.58	1.48	1.12	1.22	1.22	1.50	1.61	2.84	2.66	6.10	2.13
30.86	30.63	29.72	29.91	30.87	31.50	31.15	40.07	36.16	43.79	34.25
67.45	67.89	69.12	68.86	67.82	66.91	67.14	56.95	61.00	49.55	63.50

Table 15. Composition of plagioclase phenocrysts and groundmass (gm) from LW73FVP of Q11b

LW73ph1_gm3 gm	LW73ph1_gm3 gm	LW73ph1_gm3 gm	LW73ph2_gm1 gm	LW73ph2_gm1 gm	LW73ph2_gm1 gm	LW73ph2_gm2 gm	LW73ph2_gm2 gm	LW73ph2_gm2 gm
52.91	56.59	59.98	51.37	51.07	51.74	51.80	51.49	51.87
28.99	25.52	22.48	29.57	30.61	30.02	30.18	30.05	29.50
0.91	0.65	0.63	0.90	0.81	0.99	0.82	0.79	0.93
12.06	8.07	4.62	12.72	13.24	12.75	13.24	13.13	12.19
4.28	6.10	6.52	3.89	3.60	3.97	3.60	3.73	4.19
0.44	0.98	2.80	0.38	0.34	0.37	0.35	0.36	0.44
0.19	0.26	0.16	0.33	0.34	0.24	0.30	0.43	0.32
0.08	0.28	1.01	0.09	0.02	0.13	0.04	0.13	0.09
99.87	98.44	98.20	99.26	100.04	100.21	100.33	100.11	99.52
2.41	2.60	2.76	2.37	2.33	2.36	2.36	2.35	2.38
1.56	1.38	1.22	1.61	1.65	1.61	1.62	1.62	1.60
0.04	0.03	0.02	0.04	0.03	0.04	0.03	0.03	0.04
0.59	0.40	0.23	0.63	0.65	0.62	0.65	0.64	0.60
0.38	0.54	0.58	0.35	0.32	0.35	0.32	0.33	0.37
0.03	0.06	0.17	0.02	0.02	0.02	0.02	0.02	0.03
0.01	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01
0.00	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00
2.60	5.72	16.59	2.26	2.01	2.17	2.04	2.09	2.57
38.06	54.15	58.63	34.76	32.31	35.15	32.30	33.14	37.33
59.20	39.62	22.94	62.82	65.65	62.44	65.58	64.53	59.94

EXAMPLE

Table 15. Composition of plagioclase phenocrysts and groundmass (gm) from LW73FVP of Q11b

LW73ph4_gm1 gm	LW73ph4_gm1 gm	LW73ph4_gm1 gm	LW73ph4_gm2 gm	LW73ph4_gm2 gm	LW73ph4_gm3 gm	LW73ph4_gm3 gm
51.83	52.32	53.32	52.03	51.08	51.89	50.56
30.01	29.45	29.01	29.21	29.94	29.14	29.60
0.95	0.81	0.88	0.93	1.00	0.91	0.90
12.76	12.44	11.88	11.96	12.71	12.06	12.67
3.97	4.19	4.57	4.38	3.97	4.24	3.88
0.38	0.43	0.48	0.47	0.41	0.46	0.40
0.40	0.32	0.25	0.21	0.29	0.22	0.35
0.10	0.07	0.04	0.11	0.05	0.06	0.14
100.39	100.01	100.43	99.29	99.46	98.98	98.50
2.36	2.39	2.42	2.39	2.35	2.39	2.35
1.61	1.58	1.55	1.58	1.62	1.58	1.62
0.04	0.03	0.03	0.04	0.04	0.04	0.04
0.62	0.61	0.58	0.59	0.63	0.60	0.63
0.35	0.37	0.40	0.39	0.35	0.38	0.35
0.02	0.03	0.03	0.03	0.02	0.03	0.02
0.01	0.01	0.01	0.01	0.01	0.01	0.01
0.00	0.00	0.00	0.00	0.00	0.00	0.00
2.21	2.47	2.72	2.74	2.40	2.70	2.35
35.15	36.87	39.91	38.65	35.21	37.78	34.71
62.46	60.54	57.30	58.39	62.30	59.41	62.68

Table 16. Composition of groundmass plagioclase from LW40FVP of Ql2a

Point	lw40#6_1_1	lw40#6_2_1	lw40#6_2_2	lw40#6_2_3	lw40#3_1_1	lw40#3_1_2	lw40#3_2_1
SiO_2	53.89	51.87	50.65	51.24	51.36	52.40	51.76
Al_2O_3	28.06	29.97	30.71	30.27	30.20	29.22	29.92
FeO	0.95	0.92	0.82	1.00	1.05	1.01	0.96
CaO	10.88	12.60	13.76	13.21	13.18	11.92	12.50
Na_2O	4.91	4.00	3.52	3.67	3.78	4.40	4.21
K_2O	0.60	0.39	0.29	0.32	0.34	0.51	0.43
SrO	0.25	0.38	0.31	0.31	0.32	0.27	0.27
TOTAL	99.64	100.27	100.08	100.08	100.30	99.88	100.14
Cations based on 8 oxygens							
Si	2.46	2.37	2.32	2.34	2.35	2.40	2.36
Al	1.51	1.61	1.66	1.63	1.63	1.58	1.61
Fe	0.04	0.04	0.03	0.04	0.04	0.04	0.04
Ca	0.53	0.62	0.68	0.65	0.65	0.58	0.61
Na	0.44	0.35	0.31	0.33	0.33	0.39	0.37
K	0.04	0.02	0.02	0.02	0.02	0.03	0.03
Sr	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Or	3.51	2.27	1.71	1.85	1.97	2.97	2.50
Ab	43.27	35.55	31.10	32.77	33.42	38.76	36.84
An	53.03	61.92	67.13	65.24	64.46	57.99	60.49

EXAMPLE

Table 17. Composition of groundmass plagioclase from LW61FVP of Q13

Point	lw61fvp_#1_f1	lw61fvp_#1_f2	lw61fvp_#1_f3	lw61fvp_#1_f4
SiO_2	50.74	50.82	49.82	49.77
Al_2O_3	30.43	29.59	30.83	30.88
FeO	1.02	0.95	0.84	0.81
CaO	13.05	12.43	13.62	13.36
Na_2O	3.67	3.97	3.34	3.55
K_2O	0.37	0.40	0.27	0.30
SrO	0.30	0.29	0.25	0.28
TOTAL	99.57	98.45	98.97	98.94
Cations based on 8 oxygens				
Si	2.33	2.36	2.30	2.30
Al	1.65	1.62	1.68	1.68
Fe	0.04	0.04	0.03	0.03
Ca	0.64	0.62	0.68	0.66
Na	0.33	0.36	0.30	0.32
K	0.02	0.02	0.02	0.02
Sr	0.01	0.01	0.01	0.01
Or	2.18	2.38	1.60	1.79
Ab	33.00	35.75	30.21	31.88
An	64.82	61.87	68.19	66.33

EXAMPLE

Table 18. Composition of groundmass pyroxene from LW21FVP of Ql1d

Point	lw21_#13_b	lw21_#13_c	lw21_#14_c
SiO_2	48.24	48.90	50.10
TiO_2	2.29	2.05	1.56
Al_2O_3	4.22	3.56	2.61
Fe_2O_3	7.32	8.09	8.16
FeO	3.16	2.86	1.94
MnO	0.22	0.27	0.31
Cr_2O_3	0.02	0.03	0.00
Na_2O	0.41	0.44	0.34
MgO	13.27	13.64	14.26
CaO	20.79	20.00	20.19
TOTAL	99.92	99.83	99.47
Cations based on 6 oxygens			
Si	1.81	1.84	1.88
Ti	0.07	0.06	0.04
Al	0.19	0.16	0.12
Fe^{3+}	0.09	0.08	0.06
Fe^{2+}	0.23	0.25	0.26
Mn	0.01	0.01	0.01
Cr	0.00	0.00	0.00
Na	0.03	0.03	0.03
Mg	0.74	0.76	0.80
Ca	0.84	0.81	0.81
Wo	46.06	43.95	43.28
En	40.91	41.71	42.54
Fs	13.03	14.35	14.18

EXAMPLE

Table 19. Composition of groundmass pyroxene from LW40FVP of Ql2a

Point	lw40_#3_a1	lw40_#3_a2	lw40_#3_b1	lw40_#3_b2	lw40_#3_c1	lw40_#3_c2
SiO_2	47.73	46.45	46.88	46.68	46.15	46.88
TiO_2	3.03	3.30	3.54	3.50	3.62	3.43
Al_2O_3	4.16	4.03	4.42	4.13	4.19	4.76
Fe_2O_3	11.83	8.69	10.15	9.30	9.89	10.46
FeO	0.00	3.13	1.72	2.77	2.71	1.55
MnO	0.31	0.23	0.26	0.28	0.22	0.21
Cr_2O_3	0.02	0.01	0.00	0.02	0.01	0.01
Na_2O	0.62	0.52	0.48	0.51	0.55	0.64
MgO	10.92	11.95	11.69	11.72	11.40	11.27
CaO	19.18	20.20	20.12	20.41	19.88	19.84
TOTAL	97.80	98.51	99.26	99.31	98.62	99.05
Cations based on 6 oxygens						
Si	1.85	1.79	1.79	1.79	1.78	1.80
Ti	0.09	0.10	0.10	0.10	0.11	0.10
Al	0.19	0.18	0.20	0.19	0.19	0.22
Fe^{3+}	0.00	0.09	0.05	0.08	0.08	0.05
Fe^{2+}	0.38	0.28	0.33	0.30	0.32	0.34
Mn	0.01	0.01	0.01	0.01	0.01	0.01
Cr	0.00	0.00	0.00	0.00	0.00	0.00
Na	0.05	0.04	0.04	0.04	0.04	0.05
Mg	0.63	0.69	0.67	0.67	0.66	0.64
Ca	0.80	0.83	0.82	0.84	0.82	0.81
Wo	43.75	46.13	45.20	46.18	45.57	45.24
En	34.63	37.97	36.53	36.89	36.34	35.76
Fs	21.62	15.89	18.27	16.93	18.10	19.00

EXAMPLE

Table 20. Composition of magnetite inclusions in olivine and groundmass (gm) magnetite from LW21FVP of Qll1d

Point	lw21fvp_2m	lw21fvp_2m	lw21fvp_2ma	lw21fvp_2ma	lw21fvp_4m	lw21fvp_4m	lw21fvp_4m	lw21fvp_4ma	lw21fvp_4ma	lw21fvp_5m
SiO_2	0.11	0.10	0.15	0.09	0.11	0.10	0.08	0.08	0.07	0.10
TiO_2	10.14	8.81	13.38	11.00	14.46	16.79	18.21	16.75	16.07	7.70
Al_2O_3	8.49	9.10	5.56	8.15	4.20	3.39	2.67	3.52	4.19	13.15
Cr_2O_3	4.16	7.21	3.94	4.60	4.44	2.20	2.88	3.42	3.41	8.68
FeO	32.93	31.22	37.19	35.02	39.36	41.42	42.78	41.31	41.05	30.60
Fe_2O_3	35.66	35.18	32.36	34.16	31.80	30.58	28.58	29.78	30.28	32.37
MnO	0.23	0.31	0.38	0.34	0.42	0.55	0.59	0.49	0.42	0.28
MgO	5.08	5.59	3.83	4.32	3.13	3.03	3.07	3.26	3.14	6.12
ZnO	0.16	0.11	0.04	0.17	0.02	0.09	0.11	0.05	0.09	0.08
TOTAL	96.96	97.62	96.81	97.86	97.94	98.15	98.97	98.66	98.73	99.06
Cations based on 32 oxygens										
Si	0.03	0.03	0.04	0.03	0.03	0.03	0.02	0.02	0.02	0.03
Ti	2.20	1.88	2.97	2.38	3.21	3.73	4.03	3.70	3.54	1.59
Al	2.88	3.05	1.93	2.76	1.46	1.18	0.93	1.22	1.44	4.24
Cr	0.95	1.62	0.92	1.05	1.04	0.51	0.67	0.79	0.79	1.88
Fe^{2+}	7.73	7.53	7.18	7.39	7.06	6.80	6.32	6.57	6.67	6.67
Fe^{3+}	7.93	7.42	9.17	8.42	9.71	10.24	10.52	10.13	10.04	7.01
Mn	0.06	0.08	0.09	0.08	0.11	0.14	0.15	0.12	0.11	0.06
Mg	2.18	2.37	1.68	1.85	1.38	1.34	1.35	1.43	1.37	2.50
Zn	0.03	0.02	0.01	0.04	0.01	0.02	0.03	0.01	0.02	0.02

Table 20. Composition of magnetite inclusions in olivine and groundmass (gm) magnetite from LW21FVP of Q11d

lw21fvp_5m	lw21fvp_5m	lw21fvp_5ma	lw21fvp_5ma	lw21fvp_5mb	lw21fvp_5mb	lw21fvp_5mc gm	lw21fvp_5mc gm	lw21fvp_5mc gm	lw21fvp_5mc gm	lw21fvp_13m gm
0.08	0.08	0.12	0.10	0.09	0.11	0.14	0.07	0.10	0.10	0.12
7.53	7.51	10.78	10.67	12.75	14.02	14.51	12.52	12.20	12.60	21.61
12.96	12.33	7.66	7.60	6.20	5.45	5.40	6.26	6.20	6.11	1.95
9.21	8.43	1.95	2.41	3.48	2.89	0.38	0.37	0.37	0.33	0.07
30.32	30.09	34.06	34.00	36.88	38.57	39.83	38.11	37.55	38.18	46.09
32.59	33.27	39.01	39.33	34.58	34.08	35.01	38.52	39.22	38.43	22.84
0.21	0.26	0.27	0.28	0.38	0.46	0.40	0.32	0.39	0.32	0.43
6.26	6.06	5.01	5.11	4.07	3.77	3.14	3.37	3.48	3.31	2.26
0.10	0.07	0.12	0.17	0.09	0.08	0.08	0.14	0.07	0.00	0.12
99.25	98.10	98.98	99.66	98.51	99.42	98.89	99.66	99.58	99.37	95.49
0.02	0.02	0.03	0.03	0.03	0.03	0.04	0.02	0.03	0.03	0.04
1.55	1.57	2.31	2.27	2.77	3.04	3.17	2.71	2.64	2.74	4.98
4.18	4.03	2.56	2.53	2.11	1.85	1.85	2.12	2.10	2.08	0.71
1.99	1.85	0.44	0.54	0.80	0.66	0.09	0.08	0.08	0.08	0.02
6.71	6.95	8.34	8.36	7.52	7.38	7.66	8.34	8.49	8.35	5.27
6.93	6.98	8.10	8.03	8.91	9.29	9.69	9.17	9.04	9.22	11.81
0.05	0.06	0.06	0.07	0.09	0.11	0.10	0.08	0.09	0.08	0.11
2.55	2.51	2.12	2.15	1.75	1.62	1.36	1.44	1.49	1.42	1.03
0.02	0.02	0.03	0.03	0.02	0.02	0.02	0.03	0.02	0.00	0.03

EXAMPLE

Table 20. Composition of magnetite inclusions in olivine and groundmass (gm) magnetite from LW21FVP of Ql1d

lw21fvp_13m	lw21_#13_a	lw21_#13_a	lw21_#13_a	lw21fvp_14m	lw21_#14_a	lw21_#14_a	lw21_#14_b	lw21_#14_b	lw21_#14_b	lw21_#14_b
gm	gm	gm	gm	gm	gm	gm	gm	gm	gm	gm
0.13	0.11	0.12	0.12	0.11	0.13	0.15	0.15	0.15	0.12	0.11
21.72	20.43	19.87	20.70	18.39	18.05	20.64	20.12	20.16	19.45	19.34
1.61	1.79	1.71	1.93	2.65	1.43	1.69	1.54	1.62	1.76	1.68
0.09	0.02	0.05	0.09	0.04	0.05	0.02	0.12	0.12	0.14	0.24
45.97	44.91	44.44	45.10	42.29	44.00	44.73	44.51	44.82	43.72	43.65
23.00	27.25	27.74	26.10	30.28	31.38	26.07	27.43	27.88	28.96	29.37
0.62	0.60	0.54	0.62	0.54	0.49	0.55	0.63	0.59	0.67	0.57
2.24	2.67	2.49	2.61	3.22	1.74	2.67	2.54	2.57	2.76	2.84
0.03	0.04	0.13	0.04	0.12	0.16	0.17	0.09	0.15	0.19	0.11
95.45	97.82	97.09	97.31	97.63	97.43	96.69	97.14	98.07	97.77	97.90
0.04	0.03	0.04	0.04	0.03	0.04	0.05	0.05	0.04	0.04	0.03
5.02	4.60	4.51	4.68	4.12	4.12	4.70	4.57	4.53	4.38	4.35
0.58	0.63	0.61	0.68	0.93	0.51	0.60	0.55	0.57	0.62	0.59
0.02	0.01	0.01	0.02	0.01	0.01	0.01	0.03	0.03	0.03	0.06
5.32	6.13	6.30	5.90	6.78	7.17	5.94	6.23	6.27	6.53	6.61
11.81	11.23	11.23	11.33	10.53	11.18	11.32	11.24	11.21	10.95	10.92
0.16	0.15	0.14	0.16	0.14	0.13	0.14	0.16	0.15	0.17	0.14
1.02	1.19	1.12	1.17	1.43	0.79	1.21	1.14	1.15	1.23	1.27
0.02	0.03	0.03	0.01	0.03	0.04	0.04	0.02	0.03	0.04	0.02

EXAMPLE

Table 21. Composition of magnetite inclusions in olivine and groundmass (gm) magnetite from LW40FVP of Ql2a

Point	lw40#1_a	lw40#1_a	lw40#1_a	lw40#1_b	lw40#1_b	lw40#1_b	lw40#1_c gm	lw40#1_c gm	lw40#1_c gm	lw40#6_a gm	lw40#6_a gm
SiO_2	0.10	0.09	0.11	0.10	0.71	0.12	0.13	0.10	0.14	0.11	0.10
TiO_2	15.58	15.08	13.85	7.28	7.34	7.21	18.23	18.10	17.89	17.12	16.18
Al_2O_3	3.03	3.24	3.74	13.21	12.87	12.73	1.97	1.87	1.72	2.06	2.49
Cr_2O_3	1.67	2.00	3.84	9.37	9.35	8.85	0.32	0.21	0.17	0.41	0.68
FeO	40.62	40.02	38.60	29.09	28.61	28.83	44.24	44.11	43.66	42.56	41.57
Fe_2O_3	34.76	35.17	35.26	32.01	32.19	32.71	30.34	30.39	31.05	33.07	34.48
MnO	0.43	0.39	0.49	0.29	0.23	0.24	0.51	0.51	0.51	0.53	0.51
MgO	3.11	3.24	3.44	6.66	6.92	6.60	1.81	1.70	1.83	2.37	2.58
ZnO	0.10	0.02	0.05	0.12	0.15	0.16	0.00	0.12	0.08	0.20	0.10
TOTAL	99.39	99.23	99.37	98.12	98.37	97.44	97.56	97.10	97.04	98.42	98.68
Cations based on 32 oxygens											
Si	0.03	0.03	0.03	0.03	0.19	0.03	0.04	0.03	0.04	0.03	0.03
Ti	3.43	3.32	3.03	1.51	1.51	1.51	4.14	4.14	4.09	3.85	3.61
Al	1.05	1.12	1.28	4.28	4.14	4.17	0.70	0.67	0.62	0.72	0.87
Cr	0.39	0.46	0.88	2.04	2.02	1.94	0.08	0.05	0.04	0.10	0.16
Fe^{2+}	7.66	7.75	7.73	6.63	6.61	6.83	6.90	6.96	7.11	7.43	7.70
Fe^{3+}	9.95	9.80	9.40	6.69	6.53	6.69	11.18	11.22	11.11	10.63	10.32
Mn	0.11	0.10	0.12	0.07	0.05	0.06	0.13	0.13	0.13	0.13	0.13
Mg	1.36	1.41	1.49	2.73	2.82	2.73	0.81	0.77	0.83	1.05	1.14
Zn	0.02	0.00	0.01	0.02	0.03	0.03	0.00	0.03	0.02	0.04	0.02

Table 21. Composition of magnetite inclusions in olivine and groundmass (gm) magnetite from LW40FVP of Ql2a

lw40#6_a	lw40#6_b	lw40#6_b	lw40#6_b	lw40#6_c	lw40#6_c	lw40#6_c	lw40fvp#3_m1	lw40fvp#3_m2	lw40fvp#3_m3
gm	gm	gm	gm				gm	gm	gm
0.13	0.11	0.12	0.11	0.10	0.13	0.11	0.11	0.11	0.11
16.49	17.13	16.70	16.79	14.32	15.45	16.81	17.27	21.66	20.53
2.18	1.94	2.35	2.08	3.46	2.80	1.89	2.45	1.50	1.62
0.58	0.47	0.59	0.46	3.10	1.91	1.38	0.41	0.21	0.32
41.91	42.67	42.44	42.26	39.06	40.05	41.58	42.79	47.87	46.94
34.51	34.11	34.88	34.50	35.09	34.55	33.27	32.59	22.73	25.31
0.51	0.47	0.42	0.52	0.42	0.45	0.50	0.46	0.46	0.48
2.57	2.58	2.69	2.60	3.34	3.19	2.86	2.45	1.13	1.22
0.05	0.10	0.27	0.20	0.09	0.17	0.05	0.19	0.11	0.05
98.91	99.58	100.45	99.51	98.98	98.70	98.43	98.71	95.78	96.58
0.04	0.03	0.03	0.03	0.03	0.04	0.03	0.03	0.04	0.03
3.68	3.80	3.67	3.73	3.16	3.43	3.76	3.86	5.[illegible]	4.73
0.76	0.68	0.81	0.72	1.20	0.97	0.66	0.86	0.55	0.59
0.14	0.11	0.14	0.11	0.72	0.44	0.32	0.10	0.05	0.08
7.70	7.57	7.66	7.66	7.74	7.67	7.45	7.28	5.29	5.84
10.40	10.53	10.36	10.43	9.57	9.88	10.35	10.63	12.37	12.03
0.13	0.12	0.11	0.13	0.10	0.11	0.13	0.12	0.12	0.12
1.13	1.13	1.17	1.14	1.46	1.40	1.27	1.09	0.52	0.56
0.01	0.02	0.06	0.04	0.02	0.04	0.01	0.04	0.03	0.01

EXAMPLE

Table 22. Composition of magnetite inclusions in olivine from LW135FVP of Qs2fs

Point	lw135_1_mt1	lw135_1_mt2	lw135_3_mt1	lw135_3_mt2	lw135_3_mt3	lw135_3_mt4	lw135_3_mt5	lw135_4_mt1	lw135_4_mt2
SiO_2	0.09	0.10	0.10	0.0[illegible]	0.09	0.08	0.12	0.09	0.09
TiO_2	9.44	9.11	9.96	9.5[illegible]	9.45	9.22	10.03	8.79	8.45
Al_2O_3	6.64	7.45	7.47	7.70	[illegible]	8.07	7.31	8.40	8.91
Cr_2O_3	3.96	4.46	3.66	4.25	4.03	5.42	4.6[illegible]	6.06	6.93
FeO	41.24	40.65	39.28	39.45	39.69	38.62	38.18	38.15	37.76
Fe_2O_3	33.05	32.58	33.67	33.31	32.03	32.29	33.66	31.43	31.07
MnO	0.25	0.22	0.28	0.28	0.17	0.23	0.31	0.29	0.27
MgO	4.92	5.18	4.84	4.95	5.54	5.43	4.83	5.63	5.84
TOTAL	99.59	[illegible].75	99.25	99.62	98.56	99.35	99.12	98.85	99.32
Cations based on 32 oxygens									
Si	0.03	0.03	0.03	0.03	0.03	0.02	0.03	0.03	0.02
Ti	2.02	1.93	2.13	2.04	2.02	1.95	2.15	1.87	1.78
Al	2.23	2.48	2.50	2.56	2.54	2.68	2.45	2.79	2.94
Cr	0.89	1.00	0.82	0.95	0.91	1.21	1.06	1.35	1.33
Fe^{2+}	8.82	8.63	8.40	8.39	8.49	8.19	8.17	8.10	7.95
Fe^{3+}	7.86	7.69	8.00	7.87	7.62	7.61	8.01	7.42	7.27
Mn	0.06	0.05	0.07	0.07	0.04	0.06	0.07	0.07	0.06
Mg	2.08	2.18	2.05	2.09	2.35	2.28	2.05	2.37	2.43

Table 22. Composition of magnetite inclusions in olivine from LW135FVP of Qs2fs

lw135_4_mt3	lw135_4_mt4	lw135_5_mt1	lw135_5_mt2	lw135_5_mt3	lw135_5_mt4
0.16	0.11	0.10	0.09	0.10	0.10
9.02	9.75	10.77	7.38	9.06	8.80
7.96	7.06	6.68	10.28	7.46	8.24
7.08	2.97	1.02	8.68	5.51	5.93
36.57	40.95	41.19	36.40	38.86	38.07
32.33	32.37	33.55	29.69	31.91	31.54
0.24	0.23	0.24	0.21	0.22	0.18
5.09	5.46	5.22	6.23	5.33	5.54
98.44	98.90	98.76	98.94	98.44	98.50
0.05	0.03	0.03	0.02	0.03	0.03
1.93	2.09	2.32	1.54	1.94	1.88
2.67	2.37	2.25	3.37	2.51	2.75
1.59	0.67	0.23	1.91	1.24	1.35
7.83	8.76	8.86	7.62	8.34	8.12
7.69	7.70	8.02	6.90	7.61	7.48
0.06	0.05	0.06	0.05	0.05	0.04
2.16	2.32	2.22	2.58	2.27	2.34

EXAMPLE

Table 23. Composition of magnetite inclusions in olivine and groundmass (gm) magnetite from LW61FVP of Ql3

Point	lw61fvp_2_m1	lw61fvp_2_m2	lw61fvp_2_m3	lw61fvp_2_m4	lw61fvp_4_m1	lw61fvp_4_m2	lw61fvp_4_m3 gm	lw61fvp_4_m4
SiO_2	0.09	0.11	0.08	0.08	0.12	0.12	0.07	0.12
TiO_2	15.39	15.16	9.15	8.24	14.97	14.87	13.73	15.86
Al_2O_3	3.31	3.67	9.03	9.73	3.67	4.20	4.67	3.33
Cr_2O_3	1.48	1.92	9.09	7.41	2.16	0.61	2.81	0.18
FeO	40.08	38.79	32.04	29.89	38.02	37.78	36.89	40.34
Fe_2O_3	34.75	35.10	34.29	37.19	35.43	36.05	35.91	35.28
MnO	0.46	0.37	0.33	0.26	0.41	0.38	0.40	0.46
MgO	3.26	4.14	5.71	6.59	4.51	4.51	4.58	3.38
ZnO	0.05	0.21	0.01	0.04	0.17	0.00	0.04	0.17
TOTAL	98.86	99.48	99.74	99.42	99.45	98.53	99.39	99.11
Cations based on 32 oxygens								
Si	0.03	0.03	0.02	0.02	0.04	0.03	0.02	0.04
Ti	3.40	3.30	1.92	1.72	3.25	3.25	2.98	3.49
Al	1.15	1.25	2.96	3.17	1.25	1.[illegible]4	1.59	1.15
Cr	0.34	0.44	2.00	1.62	0.49	0.14	0.64	0.04
Fe^{2+}	9.84	9.40	7.46	6.92	9.18	9.18	8.90	9.88
Fe^{3+}	7.68	7.65	7.18	7.75	7.70	7.88	7.79	7.77
Mn	0.11	0.09	0.08	0.06	0.10	0.10	0.10	0.11
Mg	1.43	1.79	2.37	2.72	1.94	1.96	1.97	1.47
Zn	0.01	0.04	0.00	0.01	0.04	0.00	0.01	0.04

INFORMATION ITEM 1

Copy of report F. Perry and K. Straub "Geochemistry of the Lathrop Wells Volcanic Center"

Information Item 5

Two each unannotated prints of aerial photographs of the Lathrop Wells volcanic center at 1:4,000. Prints are identified as 8-18-87, 1:4,000 Lathrop Wells VC - Area 25 frames 1-32, inclusive.

1 COPY
SUBMITTED

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1:4,000
WELLS N.C. AREA 25
01

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1:4,000
AREA 25
02

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1:4,000
LATHROP WELLS V C-AREA 25
03

8-18-87 1:4,000 LATHROP WELLS - V C-AREA 25

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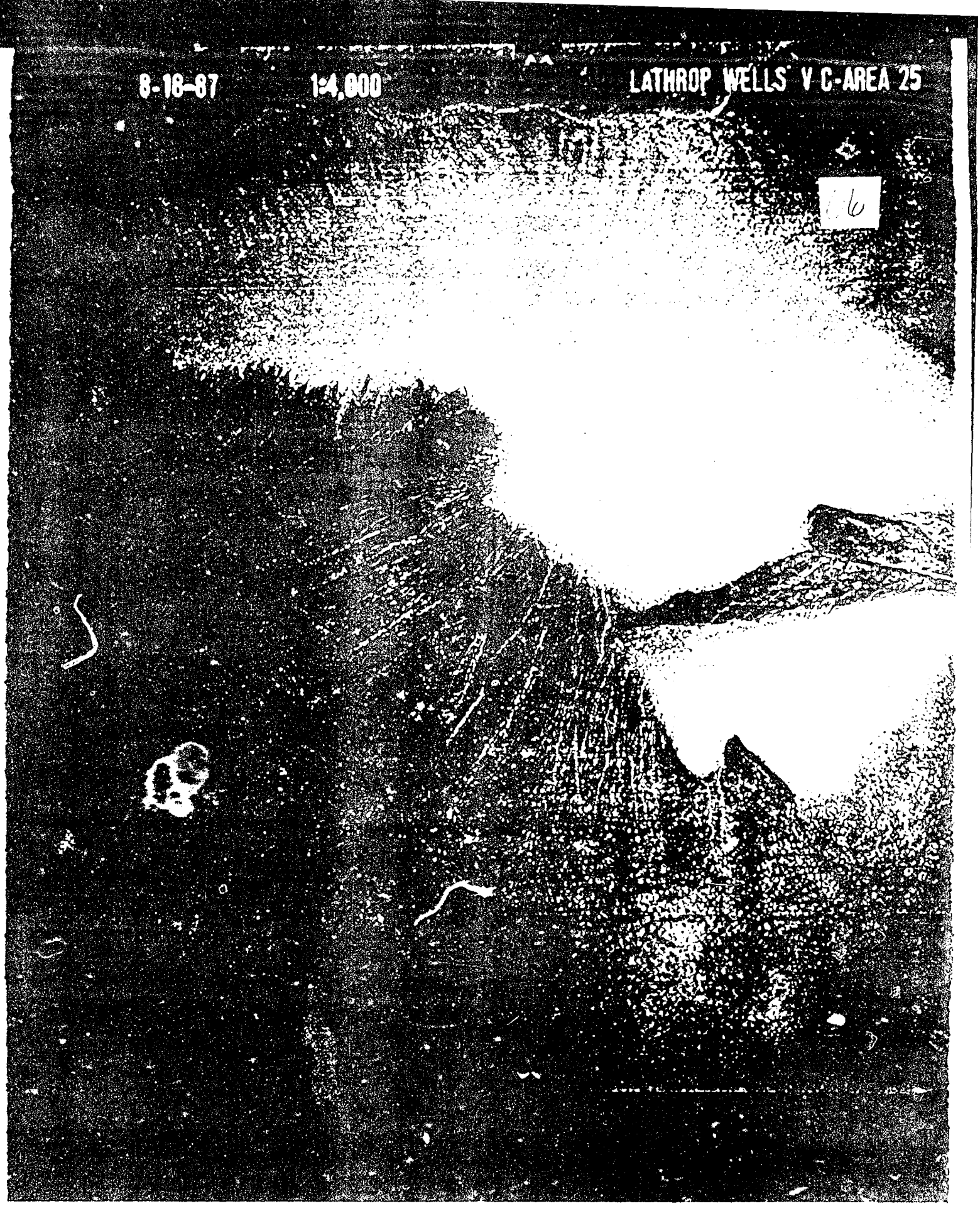
LATHROP WELLS V C-AREA 25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LATHROP WELLS V C-AREA 25

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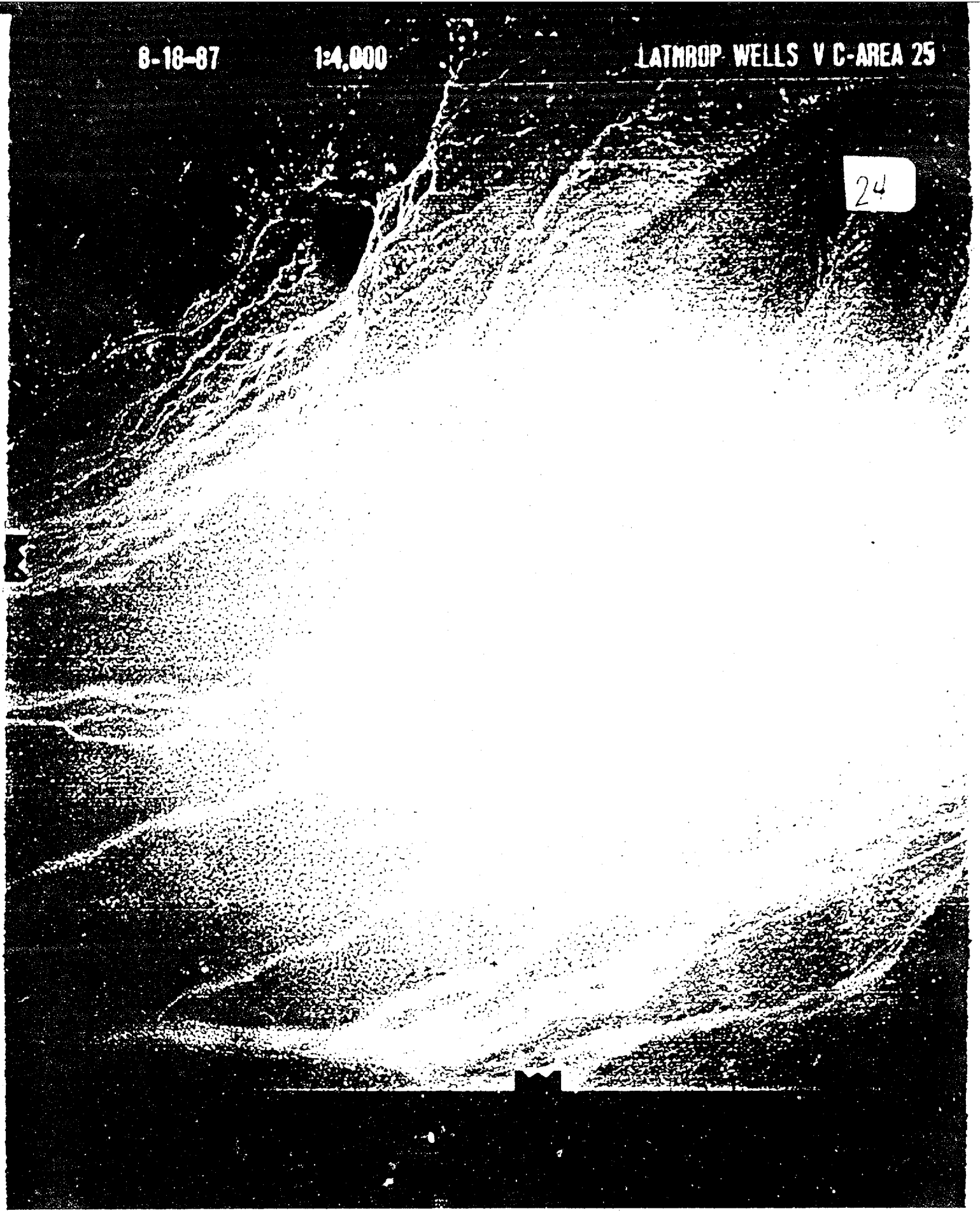
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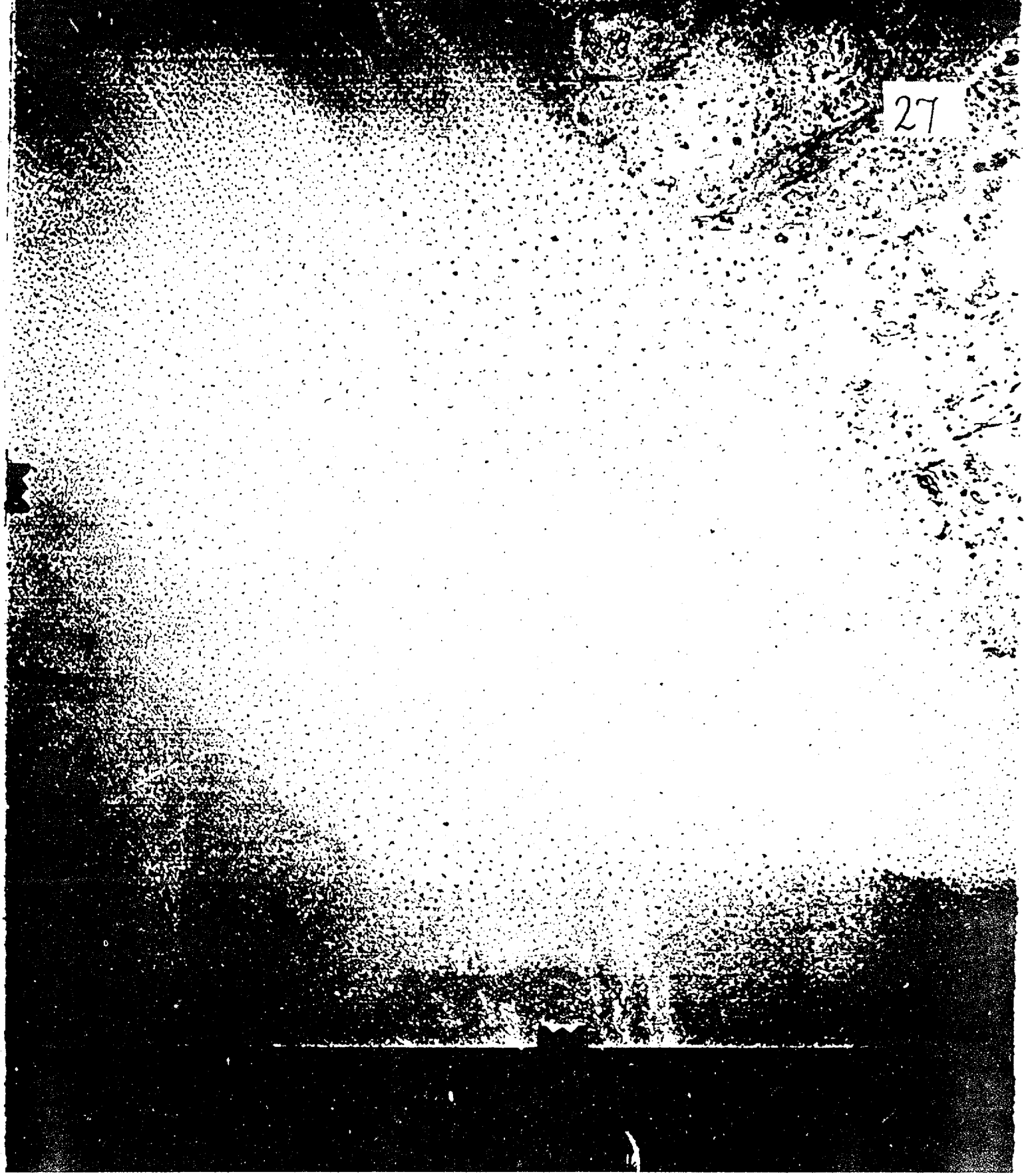

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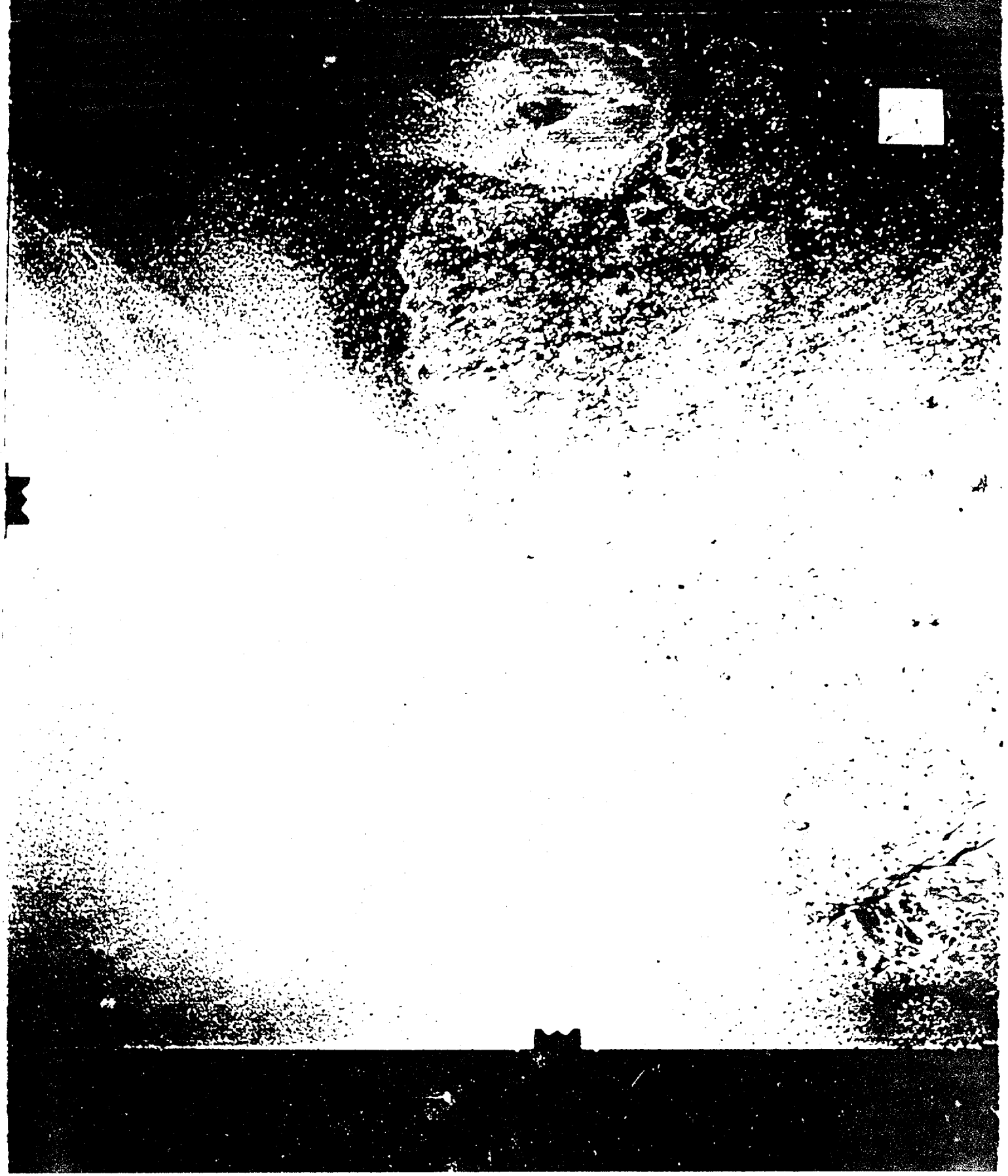

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LATHROP WELLS V C-AREA 25

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LATHROP WELLS V-C-AREA 2

2 prints each of Sleeping Butte air photos, 1:4975 EG&G 6615 Frames 007-071 inclusive dated 9/24/89.

INFORMATION ITEM 10

FIG. 6

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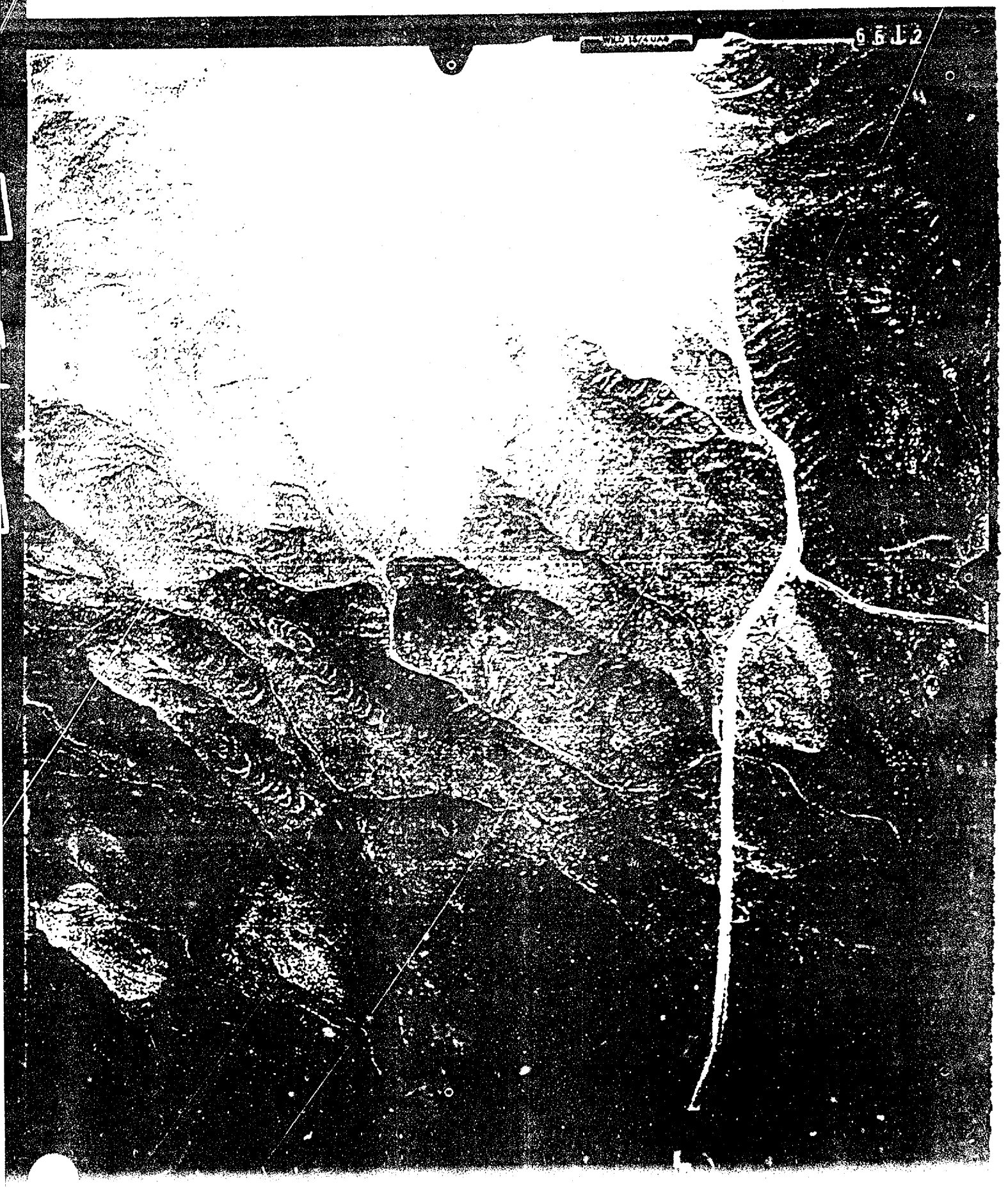
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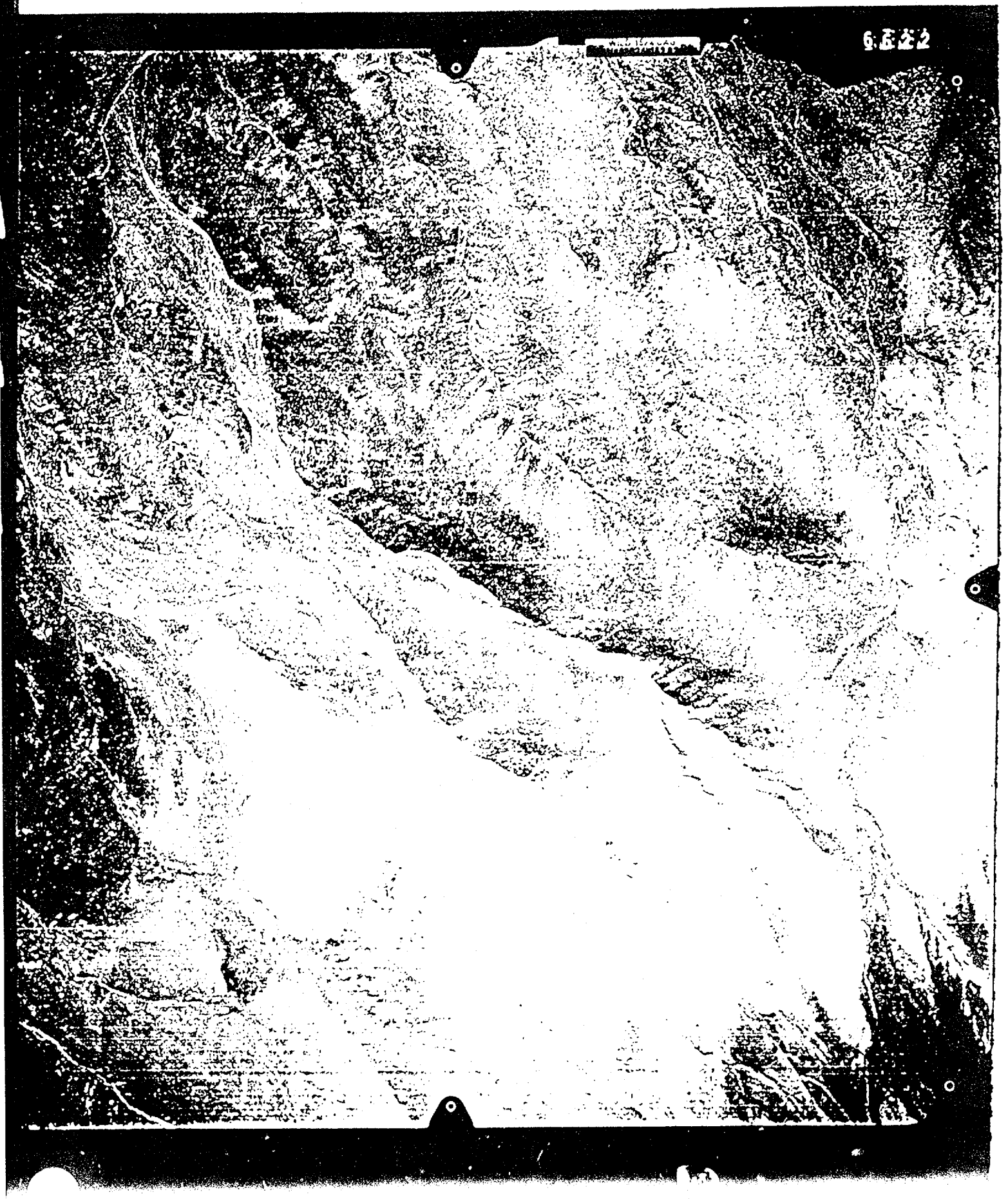
FIG. 9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