

NEVADA TEST SITE FRACTURE FILLING STUDIES PROCEDURE

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UNCLASSIFIED

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NEVADA TEST SITE FRACTURE FILLING STUDIES PROCEDURE

1. PURPOSE

The purpose of this procedure is to provide a description of the methods used in the analysis of fracture fillings in cores from drill holes on and near the Nevada Test Site, such as Yucca Mountain drill hole USW G-4. Core selection and identification, examination, and documentation are described. This procedure may be used for sub-tasks which require detailed analysis of any rock or mineral surfaces.

2. SCOPE

This procedure applies to any Nevada Test Site core taken for the NNWSI project. Data obtained using this procedure will be used in site characterization and the procedure is therefore Quality Level 1.

3. PROCEDURE

3.1 Core Selection and Identification

Core samples are selected at the site by qualified Los Alamos staff geologists. Sufficient core is selected to (1) provide representative sampling of homogeneous fracture fillings and (2) characterize different fracture fillings.

Each core sample is labeled with a sample number based on U.S. Geological Survey (USGS) core-hole designation and depth of interval sampled. This identification is specified in USGS Procedure NWM-USGS-MDP-01, Identification, Handling, Storage, and Disposition of Drill Hole Core and Samples. The sample number, depth from the surface of the drill hole, and a brief hand specimen description are recorded for each sample. Samples may be selected for specific studies.

3.2 Binocular Microscope Description of Fracture Material

Descriptions of each sample are made by qualified Los Alamos staff geologists using a stereo microscope capable of 50X magnification. Descriptions include color, texture, hardness, and crystal form of fracture coating minerals; where paragenetic sequence can be determined by superposition or cross-cutting relationships, that will be noted.

These descriptions are documented by entering all applicable information in the geologist's record book, a Los Alamos notebook with a unique identifying number. Entries are made by sample number for traceability, and are signed and dated by the person making the entry.

Representative areas are selected for Scanning Electron Microscope (SEM) analysis. Where enough Material is present for x-ray diffraction (XRD) analysis, it will be scraped from the face of the fracture using a steel scraper guided by the magnification provided by the binocular microscope.

Material scraped for XRD analysis is hand-picked under a binocular microscope to maximize purity, and an estimate of percent contamination by rock matrix is entered in the Los Alamos notebook with the sample description.

3.3 Thin Section Preparation and Identification

Polished thin sections suitable for microprobe analysis are made for each core sample which contains both sides of a filled fracture, in accordance with written procedures for this operation (see Sample Preparation Laboratory Procedures, TWS-ESS-DP-04). Sections are cut perpendicular to foliation or bedding unless otherwise specified.

For samples that contain only open fractures, an epoxy mount is made using either the sample already examined by SEM or a similar fragment. The sample is mounted in epoxy, cut to $3/16$ in. thickness, ground and polished until the fracture-lining minerals are intersected. Epoxy mounts are examined using the SEM to verify that the phases of interest are visible on the surface of the mount.

Thin sections and epoxy mounts are labeled by etching the sample number on the back of the section. Thin sections are stored in a labeled container at TA-3, Bldg. SM-215 in Room 269.

3.4 Petrographic Description and Documentation

Petrographic descriptions of each sample are made by qualified Los Alamos staff geologists. Descriptions include

fracture width, orientation, mineralogy, relationship to other fractures, paragenesis if determinable. Where considered necessary by the examining geologist, phases (minerals and glasses) are selected for microprobe analyses.

These descriptions are documented by entering all applicable information in the geologist's record book, a Los Alamos notebook with a unique identifying number. Entries are made by sample number for traceability, and are signed and dated by the person making the entry. Notations may also be made on photographs of thin sections used for electron microprobe analysis.

3.5 Microprobe Analysis and Documentation

Microprobe analyses are performed in accordance with written procedures for this operation. (See Operating Instructions for DV-502 Vacuum Evaporator Used in Carbon Coating Thin Sections for Microprobe Analysis, TWS-ESS-DP-06 and Microprobe Operating Procedures, TWS-ESS-DP-07.) Phases for analysis are selected during microscope examination of thin sections or SEM examination of epoxy mounts (see Sections 3.3 and 3.4).

Probe results are documented in the form of computer printouts which are collected in a binder for unburst IBM printout forms. Each analysis set is labeled with the sample number for traceability. At the end of each probe run the microprobe analysis log book will be updated and signed by the analyst. If the analysis standards file has changes since the preceding run, a copy of the analysis file shall be included.

3.6 X-ray Diffraction Analysis and Documentation

X-ray diffraction analysis is performed in accordance with written procedures on material scraped from the faces of samples as described in Section 3.2 (See Siemens X-ray Diffraction Procedure, TWS-ESS-DP-16 or X-ray Powder Diffraction Analysis, TWS-ESS-DP-01). The Siemens X-ray Diffraction procedure is the preferred procedure, but when there is insufficient sample for the Siemens X-ray Diffraction procedure

to be used, a Debye-Scherrer analysis (using procedure TWS-ESS-DP-01) will be performed.

Data are identified by sample number, date, and analyst. Depending upon the procedure used, it may be on computer print-outs, strip charts, or special forms. These are placed in loose-leaf binders, which are labeled with core identification and stored at TA-3, Bldg. SM-215, Room 269. The data are also stored on floppy disks. Additional information on sample runs may be recorded in Los Alamos National Laboratory notebooks.

3.7 Scanning Electron Microscope Analysis and Documentation

Scanning electron microscope analyses are done on representative samples from each open fracture with sufficient coating material to be sampled. Electron micrographs are taken for documentation and labeled with sample number and date. They are stored in file boxes which are labeled with the drill hole designation at TA-3, Bldg. SM-215, Room 269. Peak identification (IDENT) analyses are taped into geologist's record book. Comments on observed features are also noted in record book.

3.8 Mineralogical Determination and Documentation

Mineralogy of phases is determined for each sample by a qualified Los Alamos staff geologist using information obtained according to procedures described in Sections 3.2, 3.4, 3.5, 3.6, and 3.7.

Results are recorded in the geologist's record book, a Los Alamos National Laboratory notebook. Original hard copies of microprobe data are compiled in one binder or series of binders for each drill hole studied. X-ray diffraction data for each drill hole studied are also placed in binders.

4. QUALITY ASSURANCE

4.1 Personnel

This fracture filling studies procedure shall be performed by personnel with a geoscience degree or who can demonstrate an equivalent combination of education and experience. Evidence

of qualification shall be documented according to the personnel certification procedure TWS-MSTQA-QP-08.

4.2 Calibration

Any calibration that is required shall be performed in accordance with the following applicable procedure(s).

Procedure:

Alignment of the Siemens Diffractometer - TWS-ESS-DP-24
Sample Preparation Laboratory Procedures - TWS-ESS-DP-04
Microprobe Operating Procedure - TWS-ESS-DP-07

5. RECORDS

- 5.1 Documentation and traceability of results are addressed in sections 3.2, 3.4, 3.5, 3.6, 3.7, and 3.8.
- 5.2 The investigator performing analyses in accordance with this procedure shall be responsible for the maintenance of any records generated by this work. These results shall be subjected to the peer review procedure prescribed for laboratory notebooks in the Document Control Procedure, TWS-MSTQA-QP-03.
- 5.3 A copy of any records generated by analyses performed in accordance with this procedure shall be sent to the appropriate resident file upon completion of the work.
- 5.4 Appendix 1, NNWSI Records, identifies the types of records this procedure may generate. Each record type is given a record classification, as defined in TWS-MSTQA-QP-09, Section 4.4, and given a quality level based on criteria in NVO-196-17, Nevada Nuclear Waste Storage Investigations Quality Assurance Plan. Photographs and raw data indicated as non-permanent records shall be kept until the licensing procedure is complete.

NNWSI RECORDS

This procedure may generate the following record types:

	<u>Life Time</u>	<u>Nonpermanent</u>	<u>Quality Level</u>
1. Notebooks	X		1
2. Charts, graphs, and other raw data		X	1
3. Computer data files		X	1
4. Pictures		X	1
5. Published reports	X		1

**LOS ALAMOS NATIONAL LABORATORY
NNWSI
CHANGE REQUEST**

Procedure Number TWS-ESS-DP-28, Rev 0

Change Requested

Effective date changed from September 9, 1985 to
October 17, 1985.

NNA.880202.0039



Reason for Change

Response to WMPO Audit 87-1 (SDR #5), which states in part
"LANL Procedure TWS-ESS-DP-28, Rev. 0 shows an effective
date of 9-9-85 which predates the final approval date of
10-11-85 by Quality Assurance and 10-17-85 by the Technical
Project Officer."

Change Requested By	<u>Henry Paul Nunes</u>	Date	<u>11/19/87</u>
Reviewed By	<u>Larry W Maassen</u>	Date	<u>11/19/87</u>
		Date	
QAPL Approval	<u>Larry W Maassen (Acting QAPL)</u>	Date	<u>11/19/87</u>
TPO Approval	<u>JT Delle</u>	Date	<u>11/19/87</u>
Effective Date	<u>11/19/87</u>	Date	<u>11/19/87</u>

SAIC/T&MSS

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