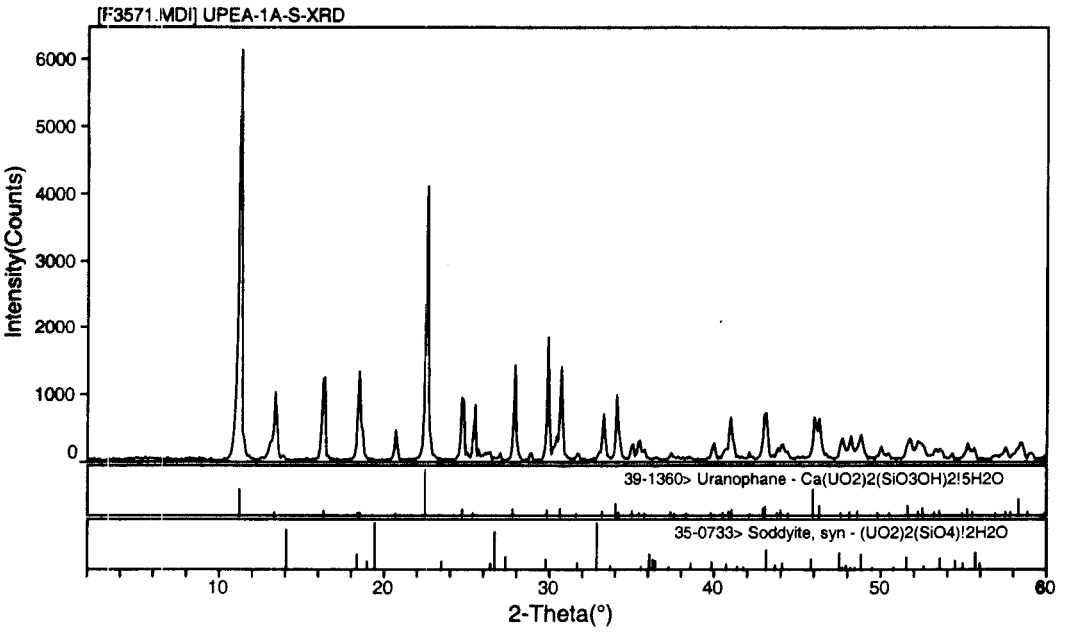
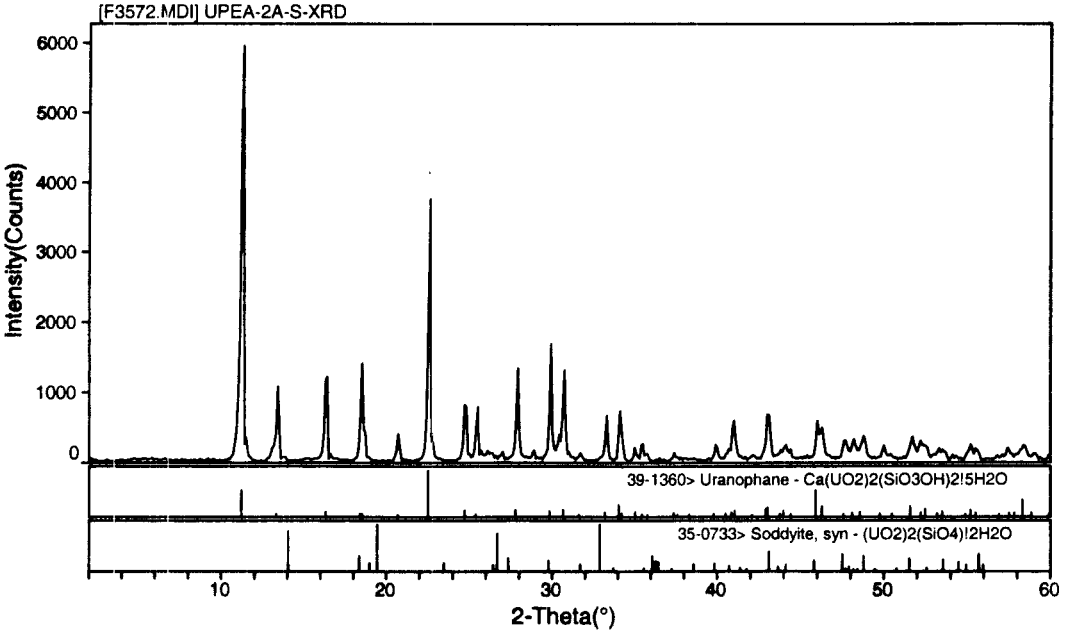
11/1/07 JP

Results of XRD analyses of uranophane sampled before and after use in solubility experiments.





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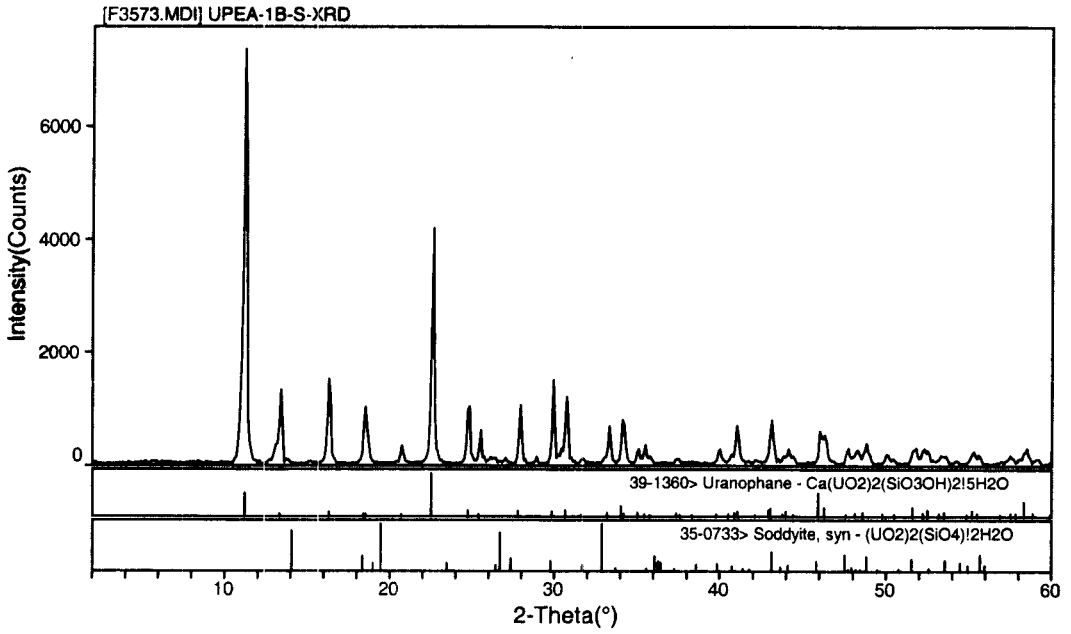
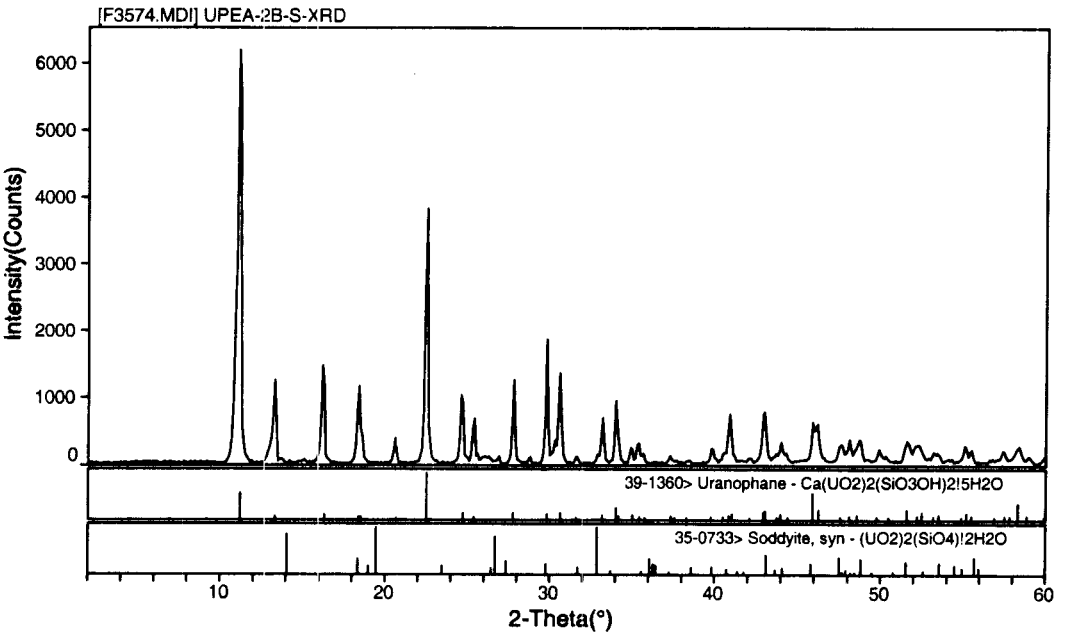
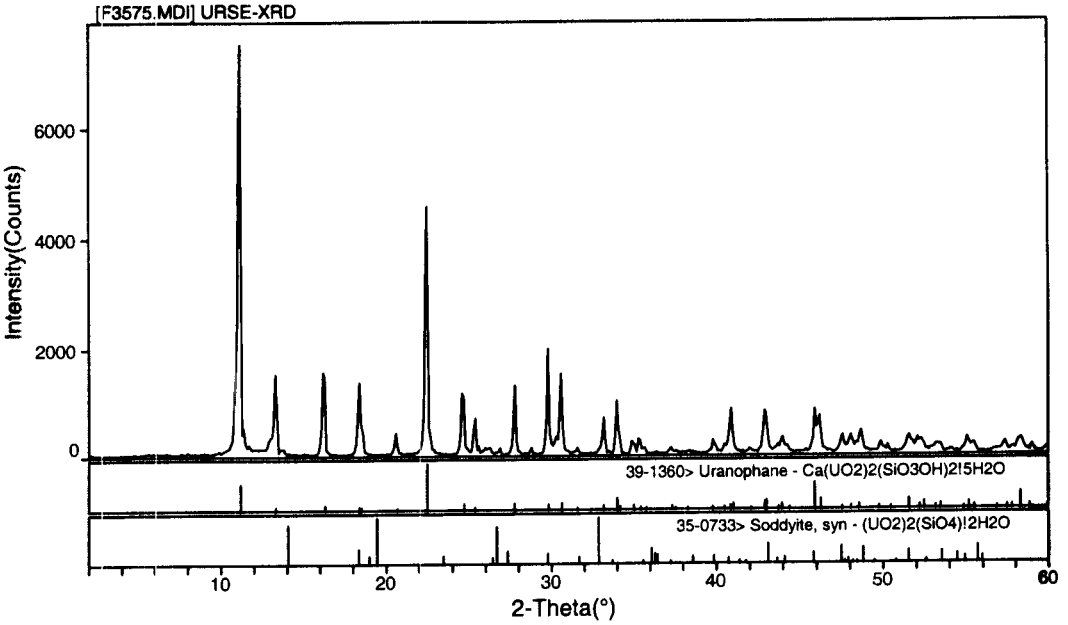
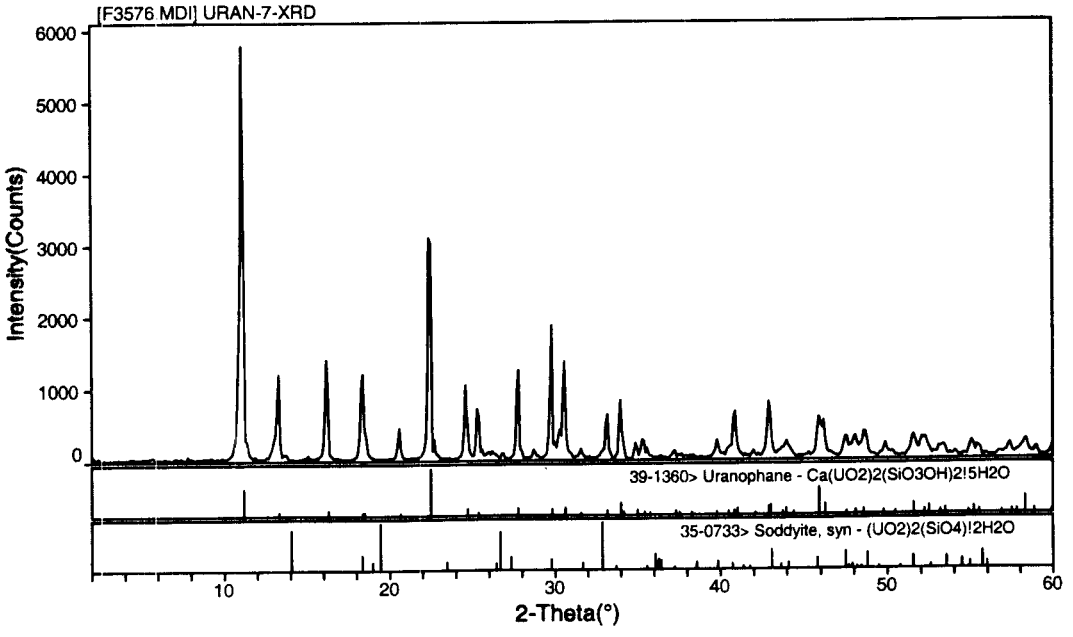

[F3573.MDI] UPEA-1B-S-XRD
Intensity(Counts)
6000
4000
2000
0
39-1360> Uranophane - Ca(UO2)2(SiO3OH)2!5H2O
35-0733> Soddyite, syn - (UO2)2(SiO4)!2H2O
10
20
30
40
50
60
2-Theta(°)


[F3574.MDI] UPEA-2B-S-XRD
Intensity(Counts)
6000
5000
4000
3000
2000
1000
0
39-1360> Uranophane - Ca(UO2)2(SiO3OH)2!5H2O
35-0733> Soddyite, syn - (UO2)2(SiO4)!2H2O
10
20
30
40
50
60
2-Theta(°)

11/1/07 JP


[F3575.MDI] URSE-XRD
Intensity(Counts)
6000
4000
2000
0
39-1360> Uranophane - Ca(UO2)2(SiO3OH)2!5H2O
35-0733> Soddyite, syn - (UO2)2(SiO4)!2H2O
10
20
30
40
50
60
2-Theta(°)


[F3576.MDI] URAN-7-XRD
Intensity(Counts)
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5000
4000
3000
2000
1000
0
39-1360> Uranophane - Ca(UO2)2(SiO3OH)2!5H2O
35-0733> Soddyite, syn - (UO2)2(SiO4)!2H2O
10
20
30
40
50
60
2-Theta(°)

11/1/07 JP

Results of chemical analyses of solutions sent to Div 01 from experiments NPUA and NPUB are shown on the following pages. → see p83-85

Hardcopies of chemical analyses for experiment NPUA are kept in a 3 ring binder entitled "NPUA Results".

Hardcopies of chemical analyses for experiment NPUB are kept in a 3 ring binder entitled "NPUB Results".

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Cobi
Copp
Iron
Lant
Lead
Lithi
Mag
Man
Moly
Nick
Palla
Phos
Potas
Seler
Silic
Silve
Sodi
Stron
Sulfu
Thall
Thori
Tin
Titan
Tung
Urani
Vana
Yttri
Zinc
Zirco

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3 85

Results of chemical analysis of experimental solutions from Np/Uranophane coprecipitation experiment NPUA.

Sample ID / Element	NPUA-M7 (mg/L)	NPUA-M8 (mg/L)	NPUA-4A (mg/L)	NPUA-4B (mg/L)	NPUA-4C (mg/L)	NPUA-M15 (mg/L)	NPUA-M16 (mg/L)	NPUA-8A (mg/L)	NPUA-8B (mg/L)	NPUA-8C (mg/L)
Aluminum	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
Antimony	<0.150	<0.150	<0.150	<0.150	<0.150	<0.150	<0.150	<0.150	<0.150	<0.150
Arsenic	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
Barium	<0.0500	<0.0500	<0.0500	0.109	0.158	<0.0500	<0.0500	<0.0500	0.0941	0.163
Beryllium	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
Bismuth	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
Boron	<0.250	<0.250	<0.250	<0.250	<0.250	<0.250	<0.250	<0.250	<0.250	<0.250
Cadmium	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
Calcium	418	419	422	427	432	422	419	418	425	431
Chromium	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
Cobalt	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
Copper	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
Iron	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Lanthanum	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
Lead	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
Lithium	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
Magnesium	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
Manganese	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
Molybdenum	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
Nickel	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
Palladium	<0.250	<0.250	<0.250	<0.250	<0.250	<0.250	<0.250	<0.250	<0.250	<0.250
Phosphorus	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200
Potassium	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00
Selenium	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
Silicon	33.5	33.6	33.5	34.1	34.6	33.2	33.1	33.2	33.5	33.7
Silver	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
Sodium	<2.50	<2.50	<2.50	<2.50	<2.50	10.2	9.80	10.4	10.6	10.0
Strontium	0.256	0.256	0.256	0.261	0.267	0.268	0.268	0.270	0.272	0.277
Sulfur	<0.250	<0.250	<0.250	<0.250	<0.250	<0.250	<0.250	<0.250	<0.250	<0.250
Thallium	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
Thorium	<0.250	<0.250	<0.250	<0.250	<0.250	<0.250	<0.250	<0.250	<0.250	<0.250
Tin	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
Titanium	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
Tungsten	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
Uranium	2.02	2.01	0.418	0.403	3.36	1.96	2.00	0.440	0.409	0.620
Vanadium	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
Yttrium	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
Zinc	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
Zirconium	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500

11/1/07 JP

Results of chemical analysis of experimental solutions from Np/Uranophane coprecipitation experiment NPUB.

Sample ID Element	NPUB-M1 (mg/L)	NPUB-M2 (mg/L)	NPUB-1A (mg/L)	NPUB-1B (mg/L)	NPUB-1C (mg/L)
Aluminum	<0.500	<0.500	<0.500	<0.500	<0.500
Antimony	<0.150	<0.150	<0.150	<0.150	<0.150
Arsenic	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
Barium	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
Beryllium	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
Bismuth	<0.100	<0.100	<0.100	<0.100	<0.100
Boron	<0.250	<0.250	<0.250	<0.250	<0.250
Cadmium	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
Calcium	498	495	495	523	515
Chromium	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
Cobalt	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
Copper	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
Iron	<1.00	<1.00	1.01	<1.00	1.30
Lanthanum	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
Lead	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
Lithium	<0.100	<0.100	<0.100	<0.100	<0.100
Magnesium	<0.500	<0.500	<0.500	<0.500	<0.500
Manganese	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
Molybdenum	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
Nickel	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
Palladium	<0.250	<0.250	<0.250	<0.250	<0.250
Phosphorus	<0.200	<0.200	<0.200	<0.200	0.480
Potassium	<3.00	3.36	<3.00	3.20	14.9
Selenium	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
Silicon	96.0	95.9	94.9	100	96.7
Silver	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
Sodium	176	176	174	186	180
Strontium	0.0793	0.0794	0.0800	0.0844	0.0844
Sulfur	<0.250	<0.250	<0.250	<0.250	<0.250
Thallium	<0.100	<0.100	<0.100	<0.100	<0.100
Thorium	<0.250	<0.250	<0.250	<0.250	<0.250
Tin	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
Titanium	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
Tungsten	<0.100	<0.100	<0.100	<0.100	<0.100
Uranium	13.6	14.3	7.65	6.08	4.37
Vanadium	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
Yttrium	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
Zinc	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500
Zirconium	<0.0500	<0.0500	<0.0500	<0.0500	<0.0500

11/12/07 JP

Responses to reviewer comments on the journal paper "The Thermodynamics of Nepheline Dissolution and Growth in $CaCl_2$-SiO_2(aq) Test Solutions" submitted to Geochimica et Cosmochimica Acta.

This paper was an IM for the WRC (IM. 06002.01.222.750)

This paper details dissolution and precipitate experiments on synthetic nepheline to derive an equilibrium constant for the nepheline dissolution reaction

Data and calculations from the experiments are listed and explained in Scientific notebook 582 pages. 192-200 and continue this in Scientific notebook (823) on pages 4-28.

The original manuscript was submitted to Geochimica et Cosmochimica Acta in May, 2007. Comments from two anonymous reviewers and an associate editor were received in July, 2007.

Reviews were mixed.

The first reviewer suggested rejection of the manuscript over concern that (1) the extreme report on nepheline thermodynamics reported by Casas et al (1994) was not considered and (2) solids were insufficiently characterized after the experiments to evaluate precipitation of phases other than nepheline. This reviewer also questioned

11/12/07

if the study did a better job at characterizing uraophane thermodynamics than previous work (eg., Pery et al 2000).

Casas et al 1994 kinetics + thermodynamic studies of uranium minerals. Assessment of the long-term evolution of spent nuclear fuel. SKB Technical Report 94-16

Pery et al 2000. The thermodynamics + kinetics of uraophane Dissolution in bicarbonate test solutions. Geochimica Cosmochimica Acta 64, 4, 603-608.

The second reviewer provided a short set of review comments and suggested publication after moderate revision. This reviewer was mainly concerned with the lack of analysis of solid product phases and interpretation provided on the Pery et al 2000 data set on uraophane dissolution.

The associate editor for GSA (Eric Oelkers) also provided a list of water + comments on the manuscript. His main concern was whether the data presented on uraophane dissolution + precipitation + mass transfer actually indicated attainment of equilibrium.

11/13/07 JF

The associate editor suggested that the manuscript be resubmitted after the following additions are made.

1) additional analysis of post-experiment solids.
2) better justification for attainment of wrongite equilibrium.
3) shortening manuscript by removing superfluous, repeated, or unneeded text.

11/14/07 JF

Based on reviews comments the following revisions were made to the GCA paper on wrongite solubility.

1) "Thermodynamic" was removed from the title of the paper since only the equilibrium constant for wrongite was measured. The new title is "Wrongite Dissolution & Growth in $CaCl_2$-SiO_2(aq) Test Solutions".

2) Abstract was shortened by removing detail on the initial aqueous solution compositions.

11/15/07 JF

3) To shorten the manuscript
- Section 4.4 (Comparison to Other Studies) and 4.5 (Significance to SNF Corrosion) were removed. Some of the information in these sections was condensed and added to Introduction Section.

- Section 4.1 (Solute Chemistry + Reaction Path Characteristics) was removed. Some of the element by element information in this section was added to the Results section.

4) Section 3.3 (Thermodynamic Calculations) moved to Discussion Section.

5) Introduction section revised to include better justification for study and to review Casas et al (1994) work.

6) Experimental Methods and Materials section is basically unchanged except that measurement uncertainties in pH and cation analyses were added.

11/19/07 JF

7) Data and analyses of precipitate test solutions P-2A (UPEA-2A) and P-2B (UPEA-2B), which had higher initial SiO_2 contents were removed from the manuscript. Further analyses of these test solutions indicated that they were not in equilibrium with quartz when the experiments were terminated (e.g., Si was still precipitating and log Qs was still increasing). The reasons for non-equilibrium are unclear but are likely due to the high Si contents. Rather than speculate about these tests and since the objective of the paper is to determine a solubility constant for quartz these test were removed. Inclusion of these test solutions in the paper would not have changed the ultimate conclusions.

JF 11/19/07

11/20/07 JP

8) Results Section

- Table 1 removed from manuscript. data in this table is in text and can be determined from the figures.

- pH and cation concentration data were replotted in Figures 2, 3, and 4 so that trends could be more easily discerned. In addition error bars showing analytical uncertainty in pH and cation analyses were added to the figures. Analytical uncertainties were ± 0.03 pH units for pH, ± 2% for Ca and Si concentrations, and ± 10% for U analyses.

Figures 2, 3, + 4 are shown on the following pages.

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11/20/07 JF

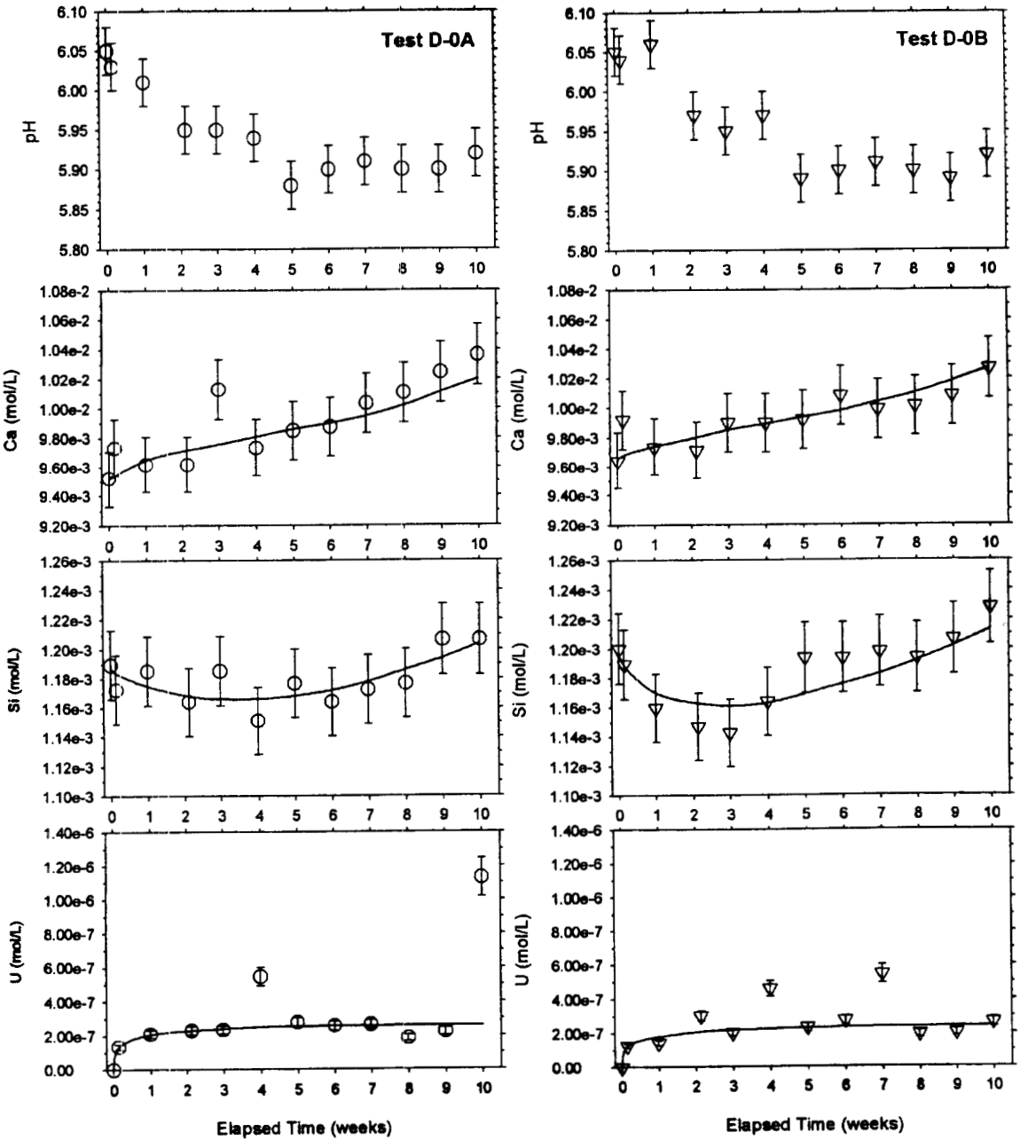

Fig 2. The pH & concentrations of Ca, Si, & U in Tests D-0A & D-0B.

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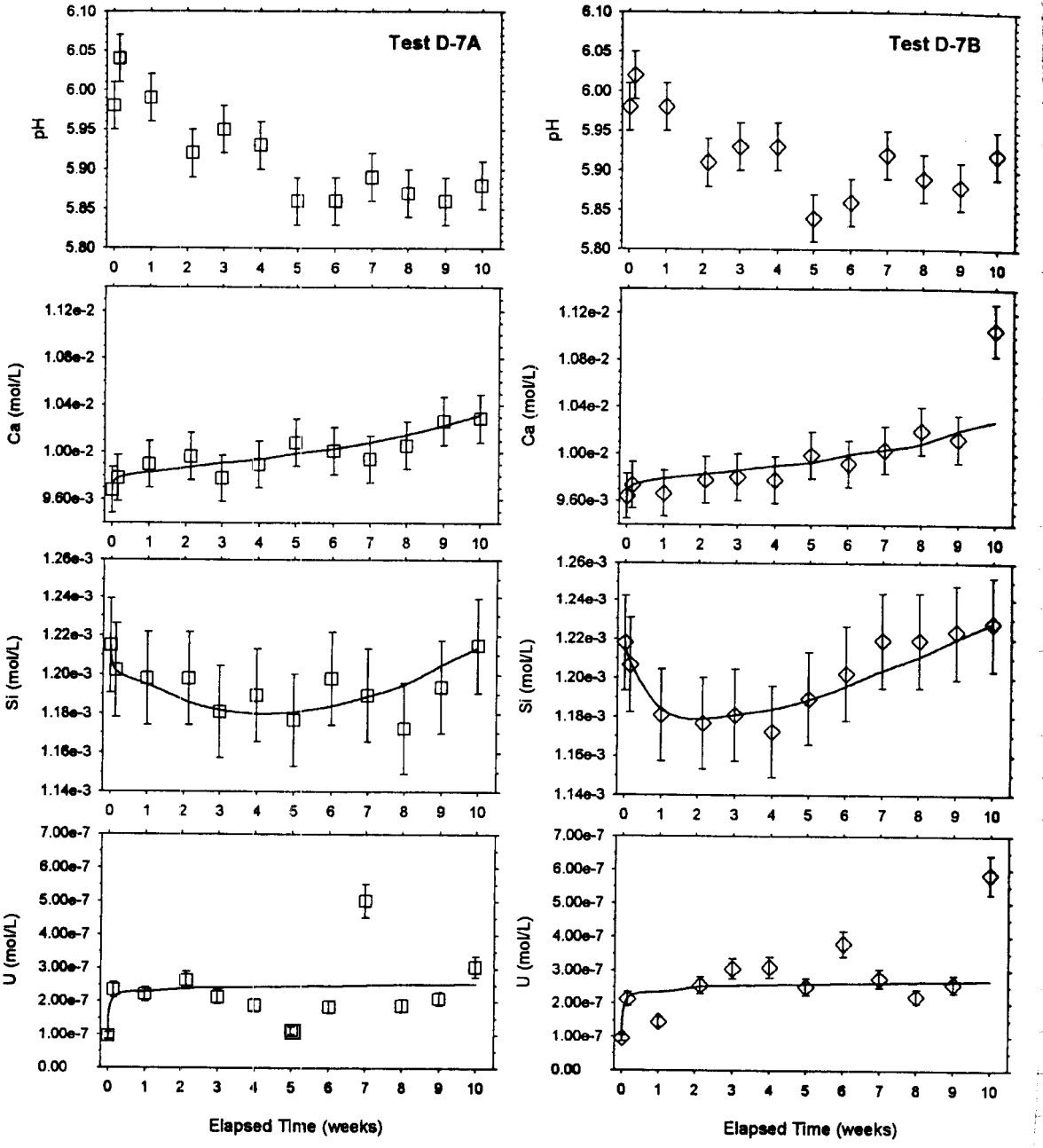


Fig 3. The pH & concentrations of Ca, Si, & U in tests D-7A & D-7B.

11/20/07 JP

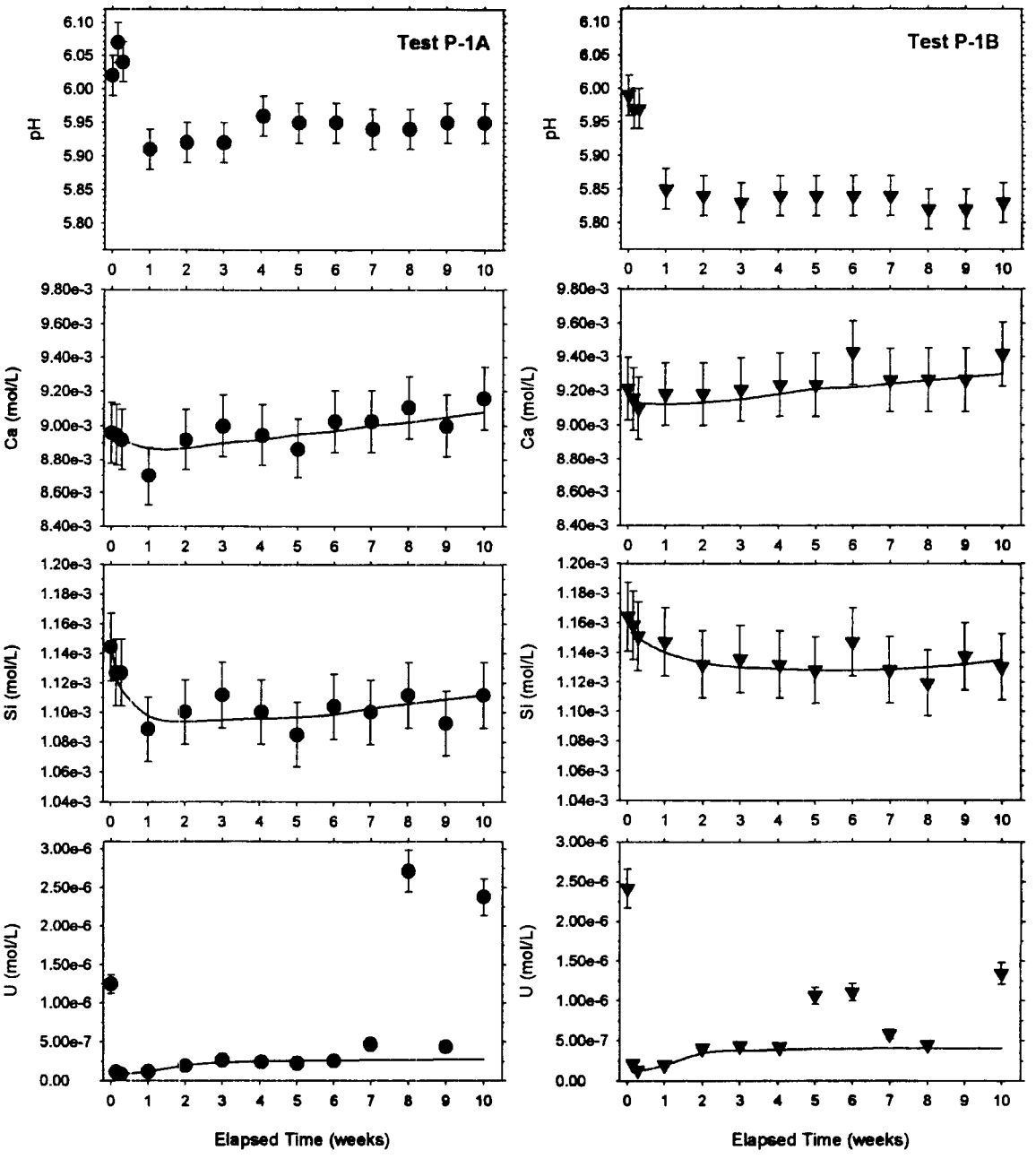


Fig 4. The pH + concentration of Ca, Si, + U in tests P-1A + P-1B

11/21/07 JP

8) Results Section (cont).

- To address concern about attainment of equilibrium, regression analyses were performed on measured Ca, Si, + U concentration data to eliminate some of the uncertainty + variation in the mass transfer data.
Regression analyses were performed using the Regression Wizard in SigmaPlot Ver 8. Before performing the regression spurious analytical data for Ca and U were removed. For Ca these data included week 3 of test D-0A + week 10 of D-7B. For U these data included week 4 and 10 of D-0A, week 4 + 7 of D-0B, week 7 of D-7A, and week 6 + 10 of D-7B, weeks 3 + 10 of P-1A, and weeks 5, 6, 5, + 10 of P-1B.

12/13/07 JP
For results of regression analyses applied to mass transfer calculations see page 127.

Best fit curves for the regression analyses are shown in Figs 2, 3, + 4 on the previous pages.

Based on calculated values from the regression analyses, mass transfer data (i.e., net moles of Ca, Si, + U released to solution) as a function of time were replotted for the dissolution tests in Fig 5 + for the precipitation tests in Fig 6. These figures are shown on the following pages and show good evidence for equilibrium in the latter parts of the tests.

11/21/07 JP

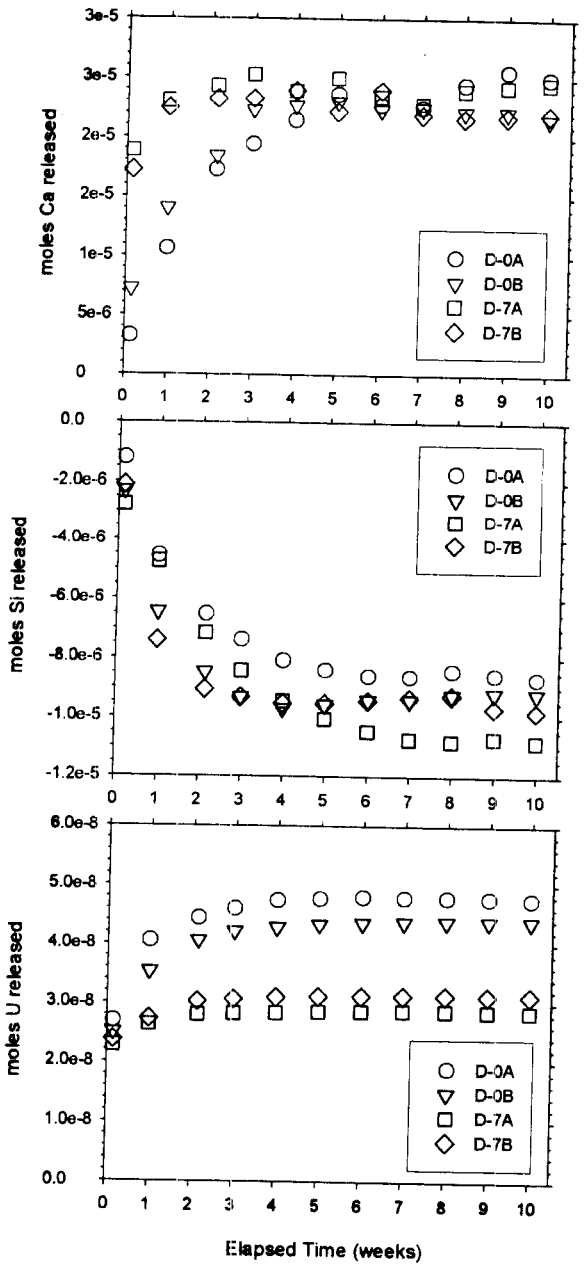


Fig 5. Net moles of Ca, Si, + U released to solution in dissolution tests.

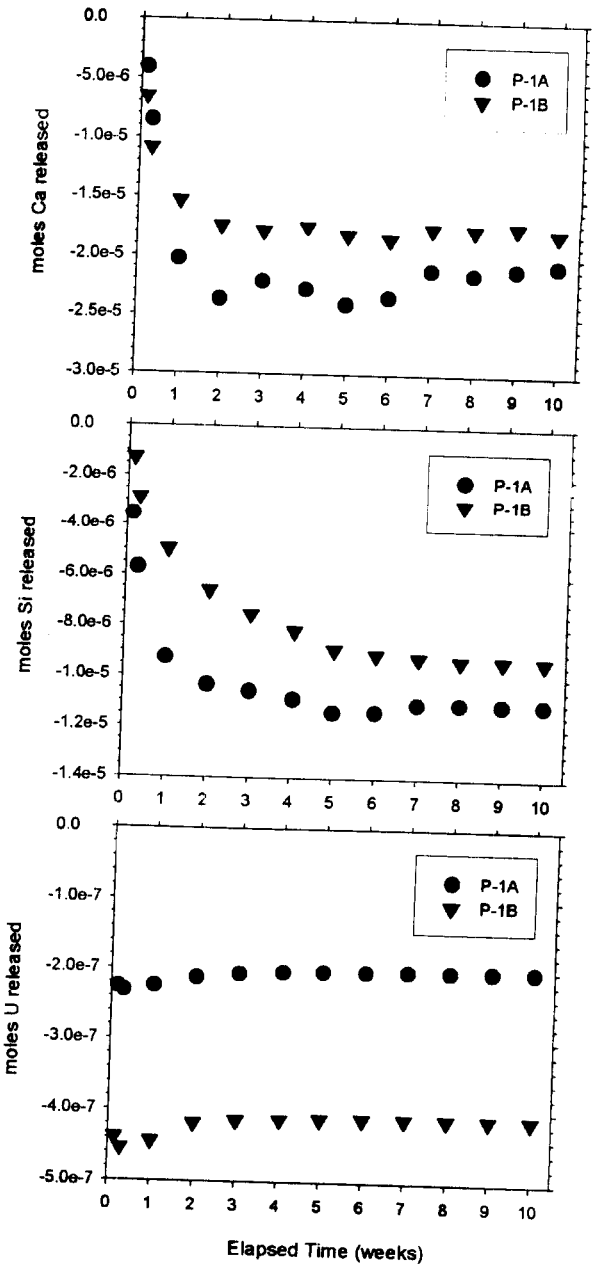


Fig 6. Net moles of Ca, Si, + U released to solution in repository tests.

11/28/07 JP

9) Dicussion Section

- Thermodynamic Calculation section moved to Discussion Section and shortened. Table 2 removed. Log Qs were recomputed using measured test solution pH and calculated Ca, Si, & U concentrations based on the regression analyses. Recomputed log Qs were replotted as Figure 8 which is shown below.

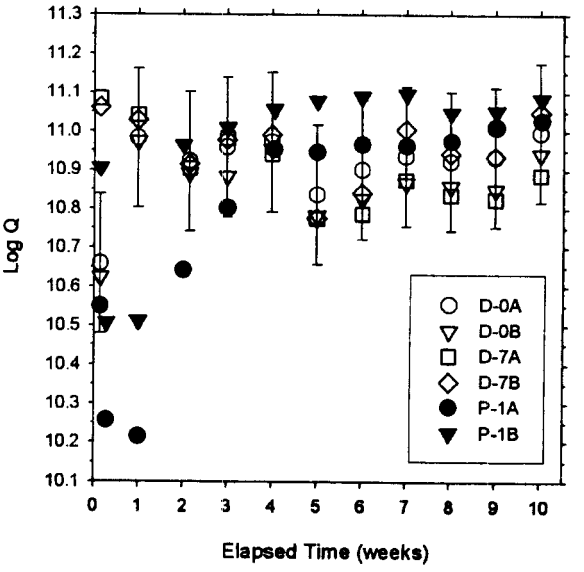


Fig 7. Calculated log Qs plotted as function of time.

Error bars show possible range in calculated log Q values resulting from error in pH measurement (±0.03 pH units) are shown for test D-0A in Fig 7.

11/28/07 JP

The possible error range for D.OA results from error in pH measurement could be expected for all test solutions.

11/29/07 JP • Evaluation of Sodalite Precipitation Section (4.2) was revised to include discussion of SEM & XRD characterization of recovered solids.

Results of SEM and XRD analysis of unreacted graphite and recovered solids from the dissolution precipitation tests are shown in scientific Notebook 582 pages 149-157 and in scientific Notebook 823 pages 91-105.

Results of SEM & XRD analyses did not show evidence for strong leach of graphite crystal or sodalite precipitation. A Figure (Figure 8) was included in the paper which detailed results of the SEM analysis. This figure is shown on the next page.

JP 11/29/07

11/24/07 JP

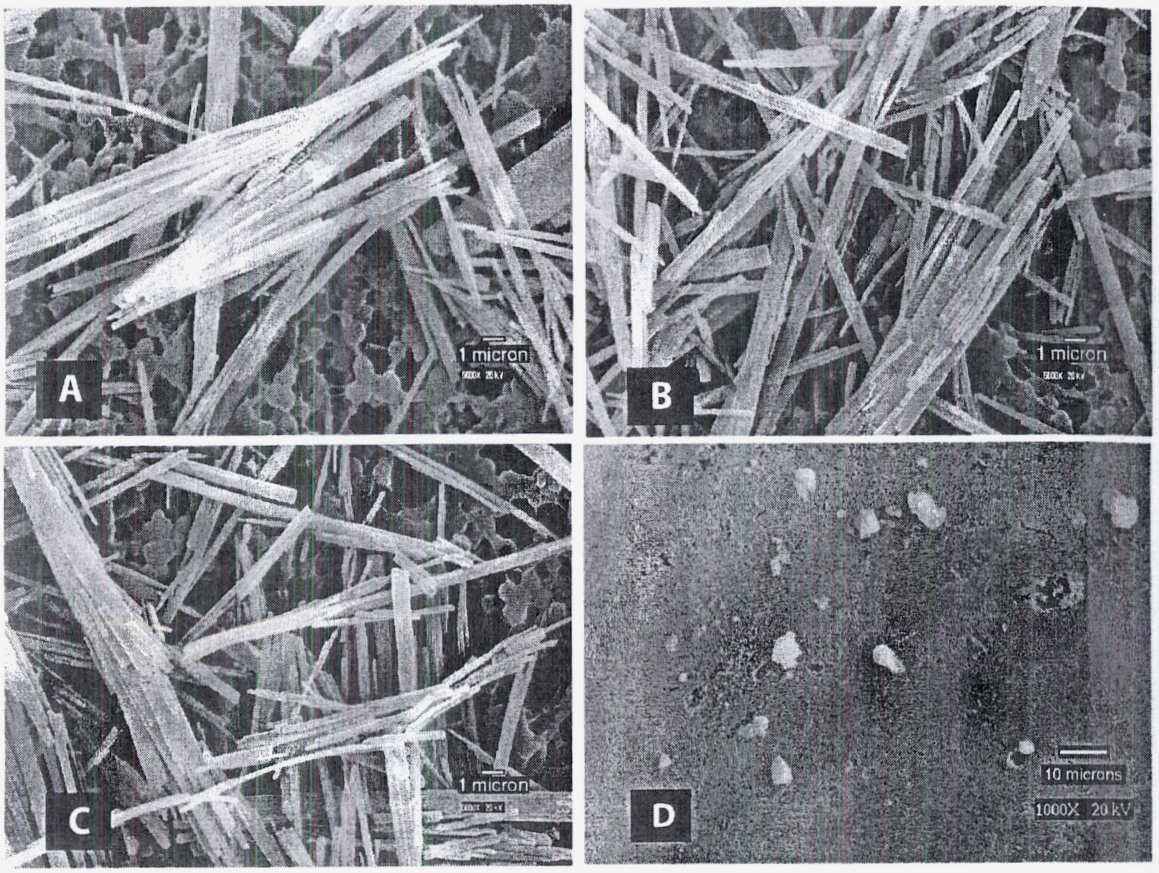
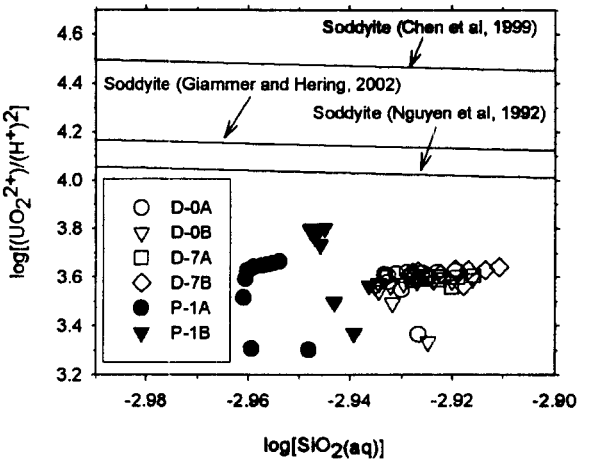


Figure 8. SEM photomicrographs showing (A) unreacted synthetic uranophane, (B) uranophane recovered from test D-0B, (C) uranophane recovered from test P-1A, and (D) particles other than uranophane recovered from test P-1A.

11/24/07 JP

11/30/07 JP

The log activity diagram of $UO_2^{2+}/(H^+)^2$ versus SiO_2 (aq) illustrating the position of the test solution with respect to the solubility limit of soddyite was replotted using UO_2^{2+}, H^+, and SiO_2 (aq) activities derived from the speciation analysis. This diagram was replotted in Figure 9 and is shown below.



11/30/07 JP

12/3/07 ggp

- Extraction of log K°_{sp} for Umpleby Dissolution Section.
  - Log K°_{sp} recomputed. For last 5 sampling intervals, range of log Qs for umpleby in dissolution tests was 10.79 to 11.06 + range of log Qs in precipitation tests was 10.96 To 11.10. The log Q midpoint between these ranges Qs 11.01 and this value was taken as best approximate for the log K°_{sp} for umpleby. Standard deviation in log Qs was 0.09.

  - A table of aqueous phase U(VI) species used to derive the log K°_{sp} was added (Table 1). Reaction & dissociation constants were extracted from the data0.com.R2 database

  - A table (Table 2) showing proportion of dominant uranyl species in the test solutes was added. Data in the table derived from EQ3NR output of measured solute pH and calculated Ca, Si, + U concentrations based on the aqueous analyses.

    These tables are shown on the next page.

12/3/07 JF

Table 1. Aqueous phase U(VI) reactions and associated thermodynamic stability constants used to derive log K°_{sp} for uranophane.

Speciation reaction	Log K (I=0)[1]
$UO_2^{2+} + H_2O = UO_2OH^+ + H^+$	-5.21
$UO_2^{2+} + 2H_2O = UO_2(OH)_2(aq) + 2H^+$	-10.31
$UO_2^{2+} + 3H_2O = UO_2(OH)_3^- + 3H^+$	-19.22
$UO_2^{2+} + 4H_2O = UO_2(OH)_4^{2-} + 4H^+$	-33.03
$2UO_2^{2+} + H_2O = (UO_2)_2OH^{3+} + H^+$	-2.71
$2UO_2^{2+} + 2H_2O = (UO_2)_2(OH)_2^{2+} + 2H^+$	-5.63
$3UO_2^{2+} + 4H_2O = (UO_2)_3(OH)_4^{2+} + 4H^+$	-11.93
$3UO_2^{2+} + 5H_2O = (UO_2)_3(OH)_5^+ + 5H^+$	-15.59
$3UO_2^{2+} + 7H_2O = (UO_2)_3(OH)_7^- + 7H^+$	-31.05
$4UO_2^{2+} + 7H_2O = (UO_2)_4(OH)_7^+ + 7H^+$	-21.95
$UO_2^{2+} + HCO_3^- = UO_2CO_3(aq) + H^+$	-0.66
$UO_2^{2+} + 2HCO_3^- = UO_2(CO_3)_2^{2-} + 2H^+$	-3.75
$UO_2^{2+} + 3HCO_3^- = UO_2(CO_3)_3^{4-} + 3H^+$	-9.43
$3UO_2^{2+} + 6HCO_3^- = (UO_2)_3(CO_3)_6^{6-} + 6H^+$	-8.06
$2UO_2^{2+} + HCO_3^- + 3H_2O = (UO_2)_2CO_3(OH)^{3-} + 4H^+$	-11.22
$3UO_2^{2+} + HCO_3^- + 3H_2O = (UO_2)_3O(OH)_2(HCO_3)^+ + 4H^+$	-9.71
$3UO_2^{2+} + HCO_3^- + 4H_2O = (UO_2)_3(OH)_5CO_2^+ + 4H^+$	-9.62
$11UO_2^{2+} + 6HCO_3^- + 12H_2O = (UO_2)_{11}(CO_3)_6(OH)_{12}^{2-} + 18H^+$	-25.73

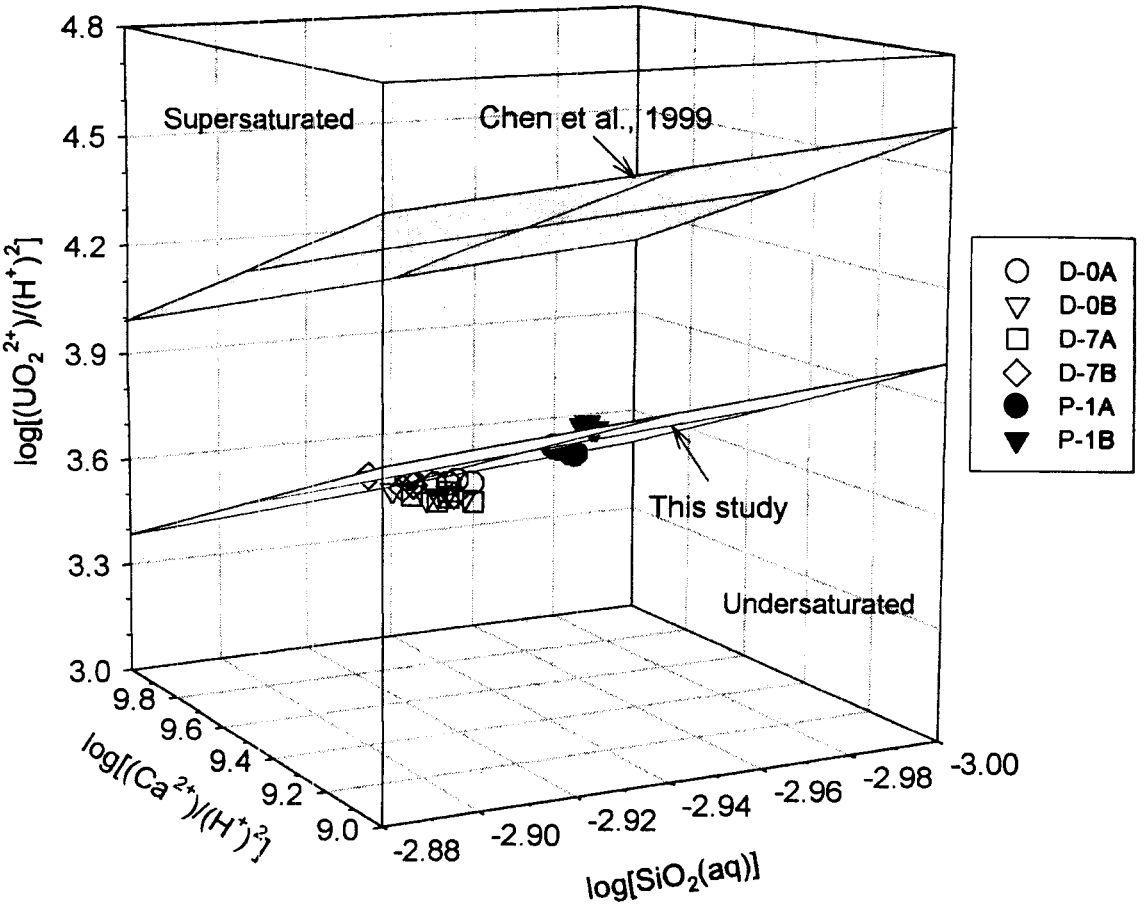
[1]Source: Grenthe et al. (1992).

Table 2. Proportions of major uranyl species in dissolution and precipitation test solutions from week 6 to 10.

	$UO_2(OH)_2(aq)$	UO_2OH^+	UO_2^{2+}	$UO_2CO_3(aq)$
Dissolution tests				
D-0A	0.780 – 0.788	0.144 – 0.148	0.045 – 0.049	0.017
D-0B	0.775 – 0.788	0.143 – 0.151	0.045 – 0.051	0.017
D-7A	0.761 – 0.775	0.151 – 0.159	0.051 – 0.057	0.017
D-7B	0.761 – 0.788	0.143 – 0.158	0.045 – 0.057	0.017
Precipitation tests				
P-1A	0.798 – 0.802	0.135 – 0.137	0.039 – 0.040	0.017
P-1B	0.741 – 0.751	0.168 – 0.163	0.061 – 0.066	0.016

12/4/07 JP

- The log activity diagram, $UO_2^{2+}/(H^+)^2$ versus $SiO_2(aq)$ versus $(Ca^{2+})/(H^+)^2$ was replotted in Figure 10 to reflect recomputed UO_2^{2+}, $SiO_2(aq)$ & Ca^{2+} activities. Figure 10 is shown below. For last 5 sampling runs.



12/10/07 JP

Conclusion section of Wrapke solubility paper was shortened by removing repeated text.

12/12/07 JP

Revised manuscript on wrapke dissolute + growth was placed into Center review.

12/13/07 JP

Results of mass transfer calculations for Ca, Si, and U in the wrapke dissolute + precipitate tests using calculated Ca, Si, + U concentrations from regression analyses of measured data are shown on the following pages.

12/13/07 JP

Sample URSE-0A (D-cA)

Amount of uranophane added =	0.5009 g
Amount of 0.0 M U solution added =	200.25 g
Total sample wt =	229.32 g
Wt of bottle =	28.57 g

Concentrations of components in starting solutions	mg/L	molality	moles
U	0	0	0
Ca	381.56	0.00952	0.00190638
Si	33.41	0.001189474	0.000238192

JP 12/13/07
Calculated by regression analysis

Sampling data	Elapsed time (hrs)	Wt of bottle before sampling (g)	Wt of soln before sampling (g)	Wt of bottle after sampling (g)	Wt of soln removed (g)	pH	U (ppm)	Ca (ppm)	Si (ppm)
	24.47	229.24	200.17	219.21	10.03	6.03	0.032	382.36	33.26
	166.42	217.81	188.74	207.80	10.01	6.01	0.050	386.77	33.01
	358.13	207.19	178.12	196.86	10.33	5.95	0.055	389.58	32.81
	502.00	196.40	167.33	186.32	10.08	5.95	0.057	391.18	32.75
	670.25	185.72	156.65	175.68	10.04	5.94	0.060	393.18	32.75
	837.58	175.16	146.09	164.97	10.19	5.88	0.060	395.19	32.81
	1007.72	164.33	135.26	154.57	9.76	5.90	0.061	396.79	32.92
	1173.60	153.92	124.85	143.97	9.95	5.91	0.061	398.80	33.09
	1342.02	143.36	114.29	133.50	9.86	5.90	0.061	401.60	33.31
	1509.78	132.68	103.61	122.68	10.00	5.90	0.062	405.21	33.54
	1677.83	121.80	92.73	111.86	9.94	5.92	0.062	408.82	33.82

Calculation of cumulative release (moles of U, Ca, Si released or precipitated as a function of time)

Defined by:

Cumulative moles released = (moles in soln at sampling time) + (moles extracted in all samples removed prior to sampling) - (initial moles in soln)

where

Moles in soln at sampling time = (measured molar concentration in sample) * (wt of soln before sampling) / 1000

Moles extracted during sampling = (measured molar concentration in sample) * (wt of soln removed during sampling) / 1000

	Elapsed time	Moles in soln at sampling time	Moles extracted during sampling	Moles extracted in all samples removed prior to sampling	Cumulative moles released
			0	0	
U	24.47	2.70228E-08	1.35405E-09	0	2.70228E-08
	166.42	3.92577E-08	2.08208E-09	1.35405E-09	4.06118E-08
	358.13	4.09674E-08	2.3759E-09	3.43613E-09	4.44035E-08
	502.00	4.0159E-08	2.4192E-09	5.81203E-09	4.5971E-08
	670.25	3.91623E-08	2.51E-09	8.23123E-09	4.73935E-08
	837.58	3.69605E-08	2.57807E-09	1.07412E-08	4.77018E-08
	1007.72	3.46263E-08	2.49856E-09	1.33193E-08	4.79456E-08
	1173.60	3.20862E-08	2.55715E-09	1.58179E-08	4.79041E-08
	1342.02	2.94866E-08	2.54388E-09	1.8375E-08	4.78616E-08
	1509.78	2.68348E-08	2.59E-09	2.09189E-08	4.77536E-08
	1677.83	2.41096E-08	2.5844E-09	2.35089E-08	4.76185E-08
			0	0	
Ca	24.47	0.001909613	9.56862E-05	0	3.23321E-06
	166.42	0.001821332	9.65965E-05	9.56862E-05	1.06385E-05
	358.13	0.001731318	0.000100408	0.000192283	1.72204E-05
	502.00	0.001633132	9.83808E-05	0.00029269	1.94423E-05
	670.25	0.001536728	9.84924E-05	0.000391071	2.14188E-05
	837.58	0.001440439	0.000100473	0.000489564	2.3622E-05
	1007.72	0.001339065	9.6624E-05	0.000590037	2.2722E-05
	1173.60	0.001242249	9.90025E-05	0.000686661	2.25294E-05
	1342.02	0.001145177	9.87972E-05	0.000785663	2.44602E-05
	1509.78	0.001047488	0.0001011	0.000884461	2.55686E-05
	1677.83	0.000945837	0.000101388	0.000985561	2.50174E-05
			0	0	
Si	24.47	0.000237	1.18755E-05	0	-1.1919E-06
	166.42	0.000221768	1.17618E-05	1.18755E-05	-4.5482E-06
	358.13	0.000208043	1.20654E-05	2.36373E-05	-6.5117E-06
	502.00	0.000195106	1.17533E-05	3.57027E-05	-7.3837E-06
	670.25	0.000182653	1.17066E-05	4.7456E-05	-8.0833E-06
	837.58	0.000170632	1.19019E-05	5.91626E-05	-8.3974E-06
	1007.72	0.000158524	1.14387E-05	7.10646E-05	-8.6039E-06
	1173.60	0.000147072	1.17211E-05	8.25033E-05	-8.6166E-06
	1342.02	0.000135547	1.1694E-05	9.42244E-05	-8.4209E-06
	1509.78	0.000123709	0.00001194	0.000105918	-8.5645E-06
	1677.83	0.000111846	1.19678E-05	0.000117858	-8.6879E-06

12/13/07 gp

Sample URSE-0B (D-0B)

Amount of uranophane added = 0.5006 g
Amount of 0.0 M U solution added = 200.06 g
Total sample wt = 229.17 g
Wt of bottle = 28.6 g

gp 12/13/07
Calculated from regression analysis

Concentrations of components in starting solutions	mg/L	molality	moles
U	0	0	0
Ca	386.37	0.00964	0.001928578
Si	33.708	0.0012	0.000240072

Sampling data	Elapsed time (hrs)	Wt of bottle before sampling (g)	Wt of soln before sampling (g)	Wt of bottle after sampling (g)	Wt of soln removed (g)	pH	U (ppm)	Ca (ppm)	Si (ppm)
	24.50	229.08	199.98	218.79	10.29	6.04	0.030	387.97	33.40
	166.42	218.32	189.22	208.28	10.04	6.06	0.043	390.38	32.87
	358.15	207.63	178.53	197.30	10.33	5.97	0.050	392.78	32.67
	502.02	196.84	167.74	186.80	10.04	5.95	0.052	394.79	32.61
	670.27	186.20	157.10	176.17	10.03	5.97	0.054	396.39	32.67
	837.60	175.54	146.44	165.55	9.99	5.89	0.055	398.19	32.84
	1007.73	164.87	135.77	155.12	9.75	5.90	0.055	400.00	33.03
	1173.62	154.38	125.28	144.44	9.94	5.91	0.056	402.40	33.23
	1342.03	143.72	114.62	133.85	9.87	5.90	0.057	404.81	33.48
	1509.80	133.03	103.93	123.10	9.93	5.89	0.057	408.01	33.76
	1677.85	122.22	93.12	112.28	9.94	5.92	0.058	411.62	34.07

Calculation of cumulative release (moles of U, Ca, Si released or precipitated as a function of time)

Defined by:
Cumulative moles released = (moles in soln at sampling time) + (moles extracted in all samples removed prior to sampling) - (initial moles in soln)
where
Moles in soln at sampling time = (measured molar concentration in sample) * (wt of soln before sampling) / 1000
Moles extracted during sampling = (measured molar concentration in sample) * (wt of soln removed during sampling) / 1000

	Elapsed time	Moles in soln at sampling time	Moles extracted during sampling	Moles extracted in all samples removed prior to sampling	Cumulative moles released
			0	0	
U	24.50	2.49974E-08	1.28625E-09	0	2.49974E-08
	166.42	3.40595E-08	1.8072E-09	1.28625E-09	3.53457E-08
	358.15	3.74912E-08	2.1693E-09	3.09345E-09	4.05846E-08
	502.02	3.69027E-08	2.2088E-09	5.26275E-09	4.21654E-08
	670.27	3.53474E-08	2.25675E-09	7.47155E-09	4.28189E-08
	837.60	3.36811E-08	2.2977E-09	9.7283E-09	4.34094E-08
	1007.73	3.16343E-08	2.27175E-09	1.2026E-08	4.36603E-08
	1173.62	2.95659E-08	2.34584E-09	1.42978E-08	4.38637E-08
	1342.03	2.72794E-08	2.34906E-09	1.66436E-08	4.3923E-08
	1509.80	2.49431E-08	2.3832E-09	1.89927E-08	4.39357E-08
	1677.85	2.25349E-08	2.40548E-09	2.13759E-08	4.39107E-08
			0	0	
Ca	24.50	0.001935801	9.96072E-05	0	7.22219E-06
	166.42	0.001842997	9.77896E-05	9.96072E-05	1.40258E-05
	358.15	0.001749588	0.000101234	0.000197397	1.84065E-05
	502.02	0.001652233	9.8894E-05	0.000298631	2.22855E-05
	670.27	0.001553713	9.91967E-05	0.000397525	2.26595E-05
	837.60	0.001454875	9.92506E-05	0.000496722	2.30185E-05
	1007.73	0.001354979	0.000097305	0.000595972	2.23724E-05
	1173.62	0.001257805	9.97976E-05	0.000693277	2.25039E-05
	1342.03	0.001157656	0.000099687	0.000793075	2.21523E-05
	1509.80	0.001058001	0.000101087	0.000892762	2.21846E-05
	1677.85	0.000956336	0.000102084	0.000993849	2.1607E-05
			0	0	
Si	24.50	0.000237776	1.22348E-05	0	-2.29649E-06
	166.42	0.000221387	1.17468E-05	1.22348E-05	-6.45049E-06
	358.15	0.00020763	1.20138E-05	2.39816E-05	-8.4607E-06
	502.02	0.000194745	1.16564E-05	3.59954E-05	-9.33116E-06
	670.27	0.000182707	1.16649E-05	4.76518E-05	-9.71356E-06
	837.60	0.000171188	1.16783E-05	5.93167E-05	-9.56761E-06
	1007.73	0.000159665	0.000011466	7.0995E-05	-9.41215E-06
	1173.62	0.000148206	1.1759E-05	8.2461E-05	-9.40543E-06
	1342.03	0.000136626	1.1765E-05	9.42201E-05	-9.22562E-06
	1509.80	0.000124923	1.19359E-05	0.000105985	-9.16376E-06
	1677.85	0.000112954	1.20572E-05	0.000117921	-9.19721E-06

12/13/07 JP

Sample UPEA-1A (P-1A)

Amount of uranophane added =	0.5002 g
Amount of matrix solution added =	200.16 g
Total sample wt =	229.21 g
Wt of bottle =	28.54 g

Concentrations of components in starting solutions	mg/L	molality	moles
U	0.29565916	1.24295E-06	2.48789E-07
Ca	359.02	0.008957477	0.001792929
Si	32.14	0.001144315	0.000229046

Sampling data	Elapsed time (hrs)	Wt of bottle before sampling (g)	Wt of soln before sampling (g)	Wt of bottle after sampling (g)	Wt of soln removed (g)	pH	U (ppm)	Ca (ppm)	Si (ppm)
	23.42	229.13	200.09	218.17	10.96	6.07	0.027	358.32	**31.66**
	47.30	218.10	189.06	207.38	10.72	6.04	0.021	357.51	**31.35**
	167.75	207.06	178.02	196.80	10.26	5.91	0.030	355.51	**30.84**
	335.60	196.42	167.38	186.43	9.99	5.92	0.048	355.51	**30.73**
	503.70	186.07	157.03	176.03	10.04	5.92	0.057	356.71	**30.76**
	679.23	175.63	146.59	165.65	9.98	5.96	0.061	357.51	**30.79**
	839.50	165.05	136.01	155.05	10.00	5.95	0.062	358.72	**30.81**
	1007.58	154.84	125.80	144.91	9.93	5.95	0.063	359.52	**30.87**
	1175.52	144.78	115.74	134.83	9.95	5.94	0.064	360.72	**30.98**
	1344.10	134.56	105.52	124.58	9.98	5.94	0.065	361.52	**31.07**
	1512.95	124.31	95.27	114.35	9.96	5.95	0.066	362.72	**31.15**
	1680.08	114.11	85.07	104.10	10.01	5.95	0.067	363.93	**31.24**

Calculation of cumulative release (moles of U, Ca, Si released or precipitated as a function of time)

Defined by:

Cumulative moles released = (moles in soln at sampling time) + (moles extracted in all samples removed prior to sampling) - (initial moles in soln)

where

Moles in soln at sampling time = (measured molar concentration in sample) * (wt of soln before sampling) / 1000

Moles extracted during sampling = (measured molar concentration in sample) * (wt of soln removed during sampling) / 1000

	Elapsed time	Moles in soln at sampling time	Moles extracted during sampling	Moles extracted in all samples removed prior to sampling	Cumulative moles released
			0	0	
U	23.42	2.30103E-08	1.2604E-09	0	-2.25778E-07
	47.30	1.70154E-08	9.648E-10	1.2604E-09	-2.30513E-07
	167.75	2.22525E-08	1.2825E-09	2.2252E-09	-2.24311E-07
	335.60	3.3476E-08	1.998E-09	3.5077E-09	-2.11805E-07
	503.70	3.76872E-08	2.4096E-09	5.5057E-09	-2.05596E-07
	679.23	3.73804E-08	2.5449E-09	7.9153E-09	-2.03493E-07
	839.50	3.53625E-08	2.6E-09	1.04602E-08	-2.02966E-07
	1007.58	3.33369E-08	2.63145E-09	1.30602E-08	-2.02392E-07
	1175.52	3.12497E-08	2.6865E-09	1.56917E-08	-2.01847E-07
	1344.10	2.88069E-08	2.72454E-09	1.83782E-08	-2.01604E-07
	1512.95	2.62945E-08	2.74896E-09	2.11027E-08	-2.01392E-07
	1680.08	2.38195E-08	2.8028E-09	2.38517E-08	-2.01117E-07
			0	0	
Ca	23.42	0.001788803	9.79824E-05	0	-4.12572E-06
	47.30	0.001686413	9.56224E-05	9.79824E-05	-8.53271E-06
	167.75	0.001579036	9.10062E-05	0.000193605	-2.02881E-05
	335.60	0.001484659	8.86113E-05	0.000284611	-2.36587E-05
	503.70	0.001397565	8.9356E-05	0.000373222	-2.2141E-05
	679.23	0.001307581	8.90216E-05	0.000462578	-2.27692E-05
	839.50	0.001217288	0.0000895	0.0005516	-2.40409E-05
	1007.58	0.001128424	8.90721E-05	0.0006411	-2.34044E-05
	1175.52	0.001041658	8.955E-05	0.000730172	-2.10983E-05
	1344.10	0.000951789	9.00196E-05	0.000819722	-2.14179E-05
	1512.95	0.000862192	9.0138E-05	0.000909742	-2.09952E-05
	1680.08	0.000772434	9.08908E-05	0.00099988	-2.06151E-05
			0	0	
Si	23.42	0.000225501	1.23519E-05	0	-3.54483E-06
	47.30	0.000210991	1.19635E-05	1.23519E-05	-5.70338E-06
	167.75	0.000195466	1.12655E-05	2.43154E-05	-9.26485E-06
	335.60	0.000183114	1.09291E-05	3.55809E-05	-1.03516E-05
	503.70	0.000171948	1.09938E-05	4.651E-05	-1.05884E-05
	679.23	0.000160662	1.09381E-05	5.75038E-05	-1.08798E-05
	839.50	0.000149203	0.00001097	6.84419E-05	-1.14014E-05
	1007.58	0.000138254	1.09131E-05	7.94119E-05	-1.13802E-05
	1175.52	0.000127661	1.09749E-05	9.03249E-05	-1.10601E-05
	1344.10	0.000116705	1.10379E-05	0.0001013	-1.10414E-05
	1512.95	0.000105654	1.10456E-05	0.000112338	-1.10542E-05
	1680.08	9.45976E-05	1.11311E-05	0.000123383	-1.10651E-05

12/13/07 JJP

Sample UPEA-1B P-15

Amount of uranophane added =	0.5004 g
Amount of 0.0 M U solution added =	200.16 g
Total sample wt =	229.27 g
Wt of bottle =	28.59 g

Concentrations of components in starting solutions

	mg/L	molality	moles
U	0.574434443	2.41329E-06	4.83043E-07
Ca	367.93	0.00918	0.001837469
Si	32.69676	0.001164	0.000232986

Sampling data

Elapsed time (hrs)	Wt of bottle before sampling (g)	Wt of soln before sampling (g)	Wt of bottle after sampling (g)	Wt of soln removed (g)	pH	U (ppm)	Ca (ppm)	Si (ppm)
23.43	229.19	200.10	218.20	10.99	5.97	0.052	366.73	32.53
47.27	218.14	189.05	207.43	10.71	5.97	0.033	365.93	32.30
167.72	207.14	178.05	197.09	10.05	5.85	0.048	365.53	32.02
335.55	196.68	167.59	186.66	10.02	5.84	0.083	365.93	31.83
503.72	186.27	157.18	176.23	10.04	5.83	0.090	366.73	31.74
679.20	175.79	146.70	165.79	10.00	5.84	0.093	367.93	31.71
839.48	165.27	136.18	155.23	10.04	5.84	0.095	369.14	31.69
1007.52	155.06	125.97	145.12	9.94	5.84	0.096	369.54	31.69
1175.53	144.97	115.88	135.05	9.92	5.84	0.097	370.34	31.70
1344.15	134.81	105.72	124.57	10.24	5.82	0.097	371.14	31.74
1512.90	124.39	95.30	114.43	9.96	5.82	0.098	371.94	31.80
1680.10	114.19	85.10	104.24	9.95	5.83	0.098	372.74	31.88

Calculation of cumulative release (moles of U, Ca, Si released or precipitated as a function of time)

Defined by:

Cumulative moles released = (moles in soln at sampling time) + (moles extracted in all samples removed prior to sampling) - (initial moles in soln)

where

Moles in soln at sampling time = (measured molar concentration in sample) * (wt of soln before sampling) / 1000

Moles extracted during sampling = (measured molar concentration in sample) * (wt of soln removed during sampling) / 1000

	Elapsed time	Moles in soln at sampling time	Moles extracted during sampling	Moles extracted in all samples removed prior to sampling	Cumulative moles released
			0	0	
U	23.43	4.40219E-08	2.4178E-09	0	-4.39021E-07
	47.27	2.64669E-08	1.4994E-09	2.4178E-09	-4.54159E-07
	167.72	3.56099E-08	2.01E-09	3.9172E-09	-4.43516E-07
	335.55	5.86564E-08	3.507E-09	5.9272E-09	-4.1846E-07
	503.72	5.97282E-08	3.8152E-09	9.4342E-09	-4.13881E-07
	679.20	5.72128E-08	3.9E-09	1.32494E-08	-4.12581E-07
	839.48	5.44718E-08	4.016E-09	1.71494E-08	-4.11422E-07
	1007.52	5.10177E-08	4.0257E-09	2.11654E-08	-4.1086E-07
	1175.53	4.72209E-08	4.0424E-09	2.51911E-08	-4.10631E-07
	1344.15	4.32393E-08	4.18816E-09	2.92335E-08	-4.1057E-07
	1512.90	3.90728E-08	4.0836E-09	3.34217E-08	-4.10549E-07
	1680.10	3.49759E-08	4.08945E-09	3.75053E-08	-4.10562E-07
			0	0	
Ca	23.43	0.001830911	0.000100559	0	-6.55746E-06
	47.27	0.001726023	9.77823E-05	0.000100559	-1.08875E-05
	167.72	0.001623812	9.1656E-05	0.000198341	-1.53156E-05
	335.55	0.001530093	9.14826E-05	0.000289997	-1.7379E-05
	503.72	0.001438193	9.1866E-05	0.000381479	-1.77961E-05
	679.20	0.001346702	0.0000918	0.000473345	-1.74211E-05
	839.48	0.001254214	9.24684E-05	0.000565145	-1.81093E-05
	1007.52	0.00116144	9.16468E-05	0.000657614	-1.84153E-05
	1175.53	0.001070728	9.16608E-05	0.000749261	-1.74807E-05
	1344.15	0.000978963	9.48224E-05	0.000840921	-1.75839E-05
	1512.90	0.00088438	9.24288E-05	0.000935744	-1.73447E-05
	1680.10	0.000791426	0.000092535	0.001028173	-1.78699E-05
			0	0	
Si	23.43	0.000231715	1.27264E-05	0	-1.2709E-06
	47.27	0.000217407	1.23165E-05	1.27264E-05	-2.85278E-06
	167.72	0.000202977	0.000011457	2.50429E-05	-4.96678E-06
	335.55	0.000189879	1.13527E-05	3.64999E-05	-6.6073E-06
	503.72	0.000177613	1.13452E-05	4.78526E-05	-7.52071E-06
	679.20	0.000165624	0.00001129	5.91978E-05	-8.16461E-06
	839.48	0.000153611	1.13251E-05	7.04878E-05	-8.88787E-06
	1007.52	0.000142094	1.12123E-05	8.18129E-05	-9.07963E-06
	1175.53	0.00013077	1.11947E-05	9.30252E-05	-9.19089E-06
	1344.15	0.000119463	1.15712E-05	0.00010422	-9.30315E-06
	1512.90	0.000107879	1.12747E-05	0.000115791	-9.31595E-06
	1680.10	9.6588E-05	1.12933E-05	0.000127066	-9.33233E-06

12/13/07 JP

Sample URSE-7A D-7A

Amount of uranophane added =	0.5004 g
Amount of 0.0 M U solution added	200.04 g
Total sample wt =	229.15 g
Wt of bottle =	28.62 g

Concentrations of components in starting solutions	mg/L	molality	moles
U	0.022886139	9.61481E-08	1.92335E-08
Ca	387.97	0.00968	0.001936387
Si	34.13086134	0.001215054	0.000243059

Sampling data

Elapsed time (hrs)	Wt of bottle before sampling (g)	Wt of soln before sampling (g)	Wt of bottle after sampling (g)	Wt of soln removed (g)	pH	U (ppm)	Ca (ppm)	Si (ppm)
24.75	229.04	199.92	219.07	9.97	6.04	0.050	391.98	33.76
166.62	218.53	189.41	208.53	10.00	5.99	0.055	393.99	33.57
358.35	207.84	178.72	197.83	10.01	5.92	0.057	395.79	33.31
502.18	197.33	168.21	187.32	10.01	5.95	0.058	397.19	33.20
670.48	186.71	157.59	176.69	10.02	5.93	0.058	398.40	33.15
837.78	176.06	146.94	166.03	10.03	5.86	0.059	400.40	33.17
1007.97	165.33	136.21	155.57	9.76	5.86	0.059	402.00	33.26
1173.83	154.82	125.70	144.89	9.93	5.89	0.060	404.21	33.40
1342.25	144.26	115.14	134.39	9.87	5.87	0.060	406.81	33.57
1510.07	133.60	104.48	123.68	9.92	5.86	0.060	410.02	33.85
1678.15	122.88	93.76	112.90	9.98	5.88	0.060	413.63	34.10

Calculation of cumulative release (moles of U, Ca, Si released or precipitated as a function of time)

Defined by:

Cumulative moles released = (moles in soln at sampling time) + (moles extracted in all samples removed prior to sampling) - (initial moles in soln)

where

Moles in soln at sampling time = (measured molar concentration in sample) * (wt of soln before sampling) / 1000

Moles extracted during sampling = (measured molar concentration in sample) * (wt of soln removed during sampling) / 1000

	Elapsed time	Moles in soln at sampling time	Moles extracted during sampling	Moles extracted in all samples removed prior to sampling	Cumulative moles released
			0	0	
U	24.75	4.19831E-08	2.0937E-09	0	2.27496E-08
	166.62	4.35642E-08	2.3E-09	2.0937E-09	2.64244E-08
	358.35	4.28927E-08	2.4024E-09	4.3937E-09	2.80529E-08
	502.18	4.07067E-08	2.42242E-09	6.7961E-09	2.82694E-08
	670.48	3.84519E-08	2.44488E-09	9.21852E-09	2.84369E-08
	837.78	3.61471E-08	2.46738E-09	1.16634E-08	2.85771E-08
	1007.97	3.378E-08	2.42048E-09	1.41308E-08	2.86773E-08
	1173.83	3.14249E-08	2.4825E-09	1.65513E-08	2.87427E-08
	1342.25	2.90152E-08	2.48724E-09	1.90338E-08	2.88155E-08
	1510.07	2.64333E-08	2.50976E-09	2.1521E-08	2.87209E-08
	1678.15	2.38149E-08	2.53492E-09	2.40308E-08	2.86122E-08
			0	0	
Ca	24.75	0.001955214	9.75066E-05	0	1.88265E-05
	166.62	0.001861896	0.0000983	9.75066E-05	2.30158E-05
	358.35	0.001764856	9.88487E-05	0.000195807	2.42755E-05
	502.18	0.001666957	9.91991E-05	0.000294655	2.52253E-05
	670.48	0.001566441	9.95988E-05	0.000393854	2.39079E-05
	837.78	0.001467927	0.0001002	0.000493453	2.49927E-05
	1007.97	0.001366182	9.78928E-05	0.000593653	2.3448E-05
	1173.83	0.00126768	0.000100144	0.000691546	2.2839E-05
	1342.25	0.001168667	0.000100181	0.00079169	2.39695E-05
	1510.07	0.001068826	0.000101482	0.00089187	2.43094E-05
	1678.15	0.000967599	0.000102994	0.000993352	2.45638E-05
			0	0	
Si	24.75	0.000240303	1.19839E-05	0	-2.756E-06
	166.62	0.000226344	0.00001195	1.19839E-05	-4.73095E-06
	358.35	0.000211961	1.18719E-05	2.39339E-05	-7.16398E-06
	502.18	0.000198824	1.18318E-05	3.58058E-05	-8.42982E-06
	670.48	0.000185956	1.18236E-05	4.76376E-05	-9.46601E-06
	837.78	0.000173536	1.18454E-05	5.94612E-05	-1.00625E-05
	1007.97	0.000161272	1.15558E-05	7.13067E-05	-1.04805E-05
	1173.83	0.000149457	1.18068E-05	8.28625E-05	-1.074E-05
	1342.25	0.000137592	1.17947E-05	9.46693E-05	-1.07983E-05
	1510.07	0.000125898	1.19536E-05	0.000106464	-1.06975E-05
	1678.15	0.000113824	1.21157E-05	0.000118418	-1.08177E-05

12/13/07 JB

Sample URSE-7B (D-7B)

Amount of uranopha	0.5008 g
Amount of 0.0 M U s	200.02 g
Total sample wt =	229.11 g
Wt of bottle =	28.58 g

Concentrations of components in starting solutions	mg/L	molality	moles
U	0.022886139	9.61481E-08	1.92315E-08
Ca	386.37	0.00964	0.001928193
Si	34.21362	0.001218	0.000243624

Sampling data	Elapsed time (hrs)	Wt of bottle before sampling (g)	Wt of soln before sampling (g)	Wt of bottle after sampling (g)	Wt of soln removed (g)	pH	U (ppm)	Ca (ppm)	Si (ppm)
	24.77	229.02	199.94	219.05	9.97	6.02	0.051	389.98	33.93
	166.62	218.42	189.34	208.12	10.30	5.98	0.056	392.38	33.26
	358.37	207.47	178.39	197.47	10.00	5.91	0.060	393.99	33.12
	502.20	196.96	167.88	186.95	10.01	5.93	0.061	395.19	33.17
	670.50	186.38	157.30	176.37	10.01	5.93	0.061	396.79	33.26
	837.80	175.75	146.67	165.74	10.01	5.84	0.062	397.99	33.40
	1007.98	165.02	135.94	155.26	9.76	5.86	0.062	400.64	33.60
	1173.85	154.50	125.42	144.61	9.89	5.92	0.063	402.40	33.82
	1342.27	144.01	114.93	134.15	9.86	5.89	0.063	404.41	34.02
	1510.08	133.03	103.95	123.12	9.91	5.88	0.064	408.82	34.27
	1678.17	122.41	93.33	112.45	9.96	5.92	0.064	412.02	34.49

Calculation of cumulative release (moles of U, Ca, Si released or precipitated as a function of time)

Defined by:

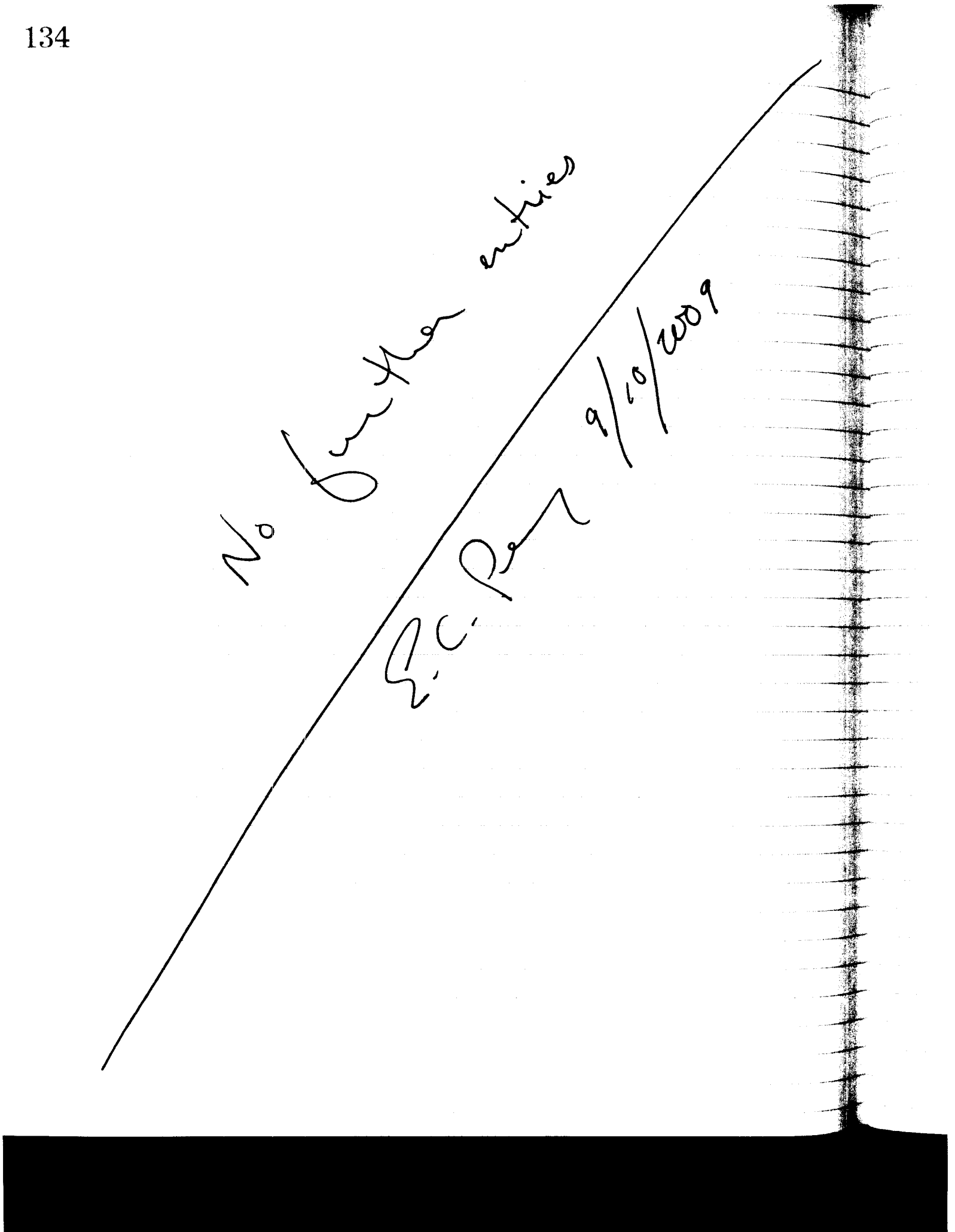
Cumulative moles released = (moles in soln at sampling time) + (moles extracted in all samples removed prior to sampling) - (initial moles in soln)

where

Moles in soln at sampling time = (measured molar concentration in sample) * (wt of soln before sampling) / 1000

Moles extracted during sampling = (measured molar concentration in sample) * (wt of soln removed during sampling) / 1000

	Elapsed time	Moles in soln at sampling time	Moles extracted during sampling	Moles extracted in all samples removed prior to sampling	Cumulative moles released
			0	0	
U	24.77	4.29869E-08	2.14355E-09	0	2.3755E-08
	166.62	4.44947E-08	2.4205E-09	2.14355E-09	2.7407E-08
	358.37	4.49541E-08	2.52E-09	4.56405E-09	3.0287E-08
	502.20	4.28092E-08	2.55255E-09	7.08405E-09	3.0662E-08
	670.50	4.05832E-08	2.58258E-09	9.6366E-09	3.0988E-08
	837.80	3.8134E-08	2.6026E-09	1.22192E-08	3.1122E-08
	1007.98	3.56161E-08	2.55712E-09	1.48218E-08	3.1206E-08
	1173.85	3.31107E-08	2.61096E-09	1.73789E-08	3.1258E-08
	1342.27	3.05712E-08	2.62276E-09	1.99899E-08	3.1329E-08
	1510.08	2.78584E-08	2.65588E-09	2.26126E-08	3.1239E-08
	1678.17	2.51989E-08	2.6892E-09	2.52685E-08	3.1236E-08
			0	0	
Ca	24.77	0.001945408	9.70081E-05	0	1.7216E-05
	166.62	0.001853631	0.000100837	9.70081E-05	2.2446E-05
	358.37	0.001753566	0.0000983	0.000197845	2.3218E-05
	502.20	0.001655289	9.86986E-05	0.000296145	2.3241E-05
	670.50	0.001557262	9.9099E-05	0.000394844	2.3913E-05
	837.80	0.001456425	9.93993E-05	0.000493943	2.2175E-05
	1007.98	0.001358848	9.7561E-05	0.000593342	2.3997E-05
	1173.85	0.001259209	9.92956E-05	0.000690903	2.1919E-05
	1342.27	0.001159636	9.94874E-05	0.000790199	2.1641E-05
	1510.08	0.001060282	0.000101082	0.000889686	2.1775E-05
	1678.17	0.000959424	0.000102389	0.000990768	2.1999E-05
			0	0	
Si	24.77	0.000241527	1.20438E-05	0	-2.0978E-06
	166.62	0.000224178	1.21952E-05	1.20438E-05	-7.403E-06
	358.37	0.000210321	0.00001179	2.4239E-05	-9.0645E-06
	502.20	0.000198265	1.18218E-05	3.6029E-05	-9.3301E-06
	670.50	0.000186242	1.18518E-05	4.7850BE-05	-9.5313E-06
	837.80	0.00017439	1.19019E-05	5.97026E-05	-9.5321E-06
	1007.98	0.000162583	1.1673E-05	7.16045E-05	-9.4366E-06
	1173.85	0.000151005	1.19076E-05	8.32775E-05	-9.3422E-06
	1342.27	0.000139179	1.19405E-05	9.5185E-05	-9.2601E-06
	1510.08	0.000126818	1.20502E-05	0.000107125	-9.6809E-06
	1678.17	0.000114608	1.22309E-05	0.000119216	-9.8004E-06


No further entries
E.C. Pa
9/10/2009