PRECISION MINOR ELEMENT ANALYSES OF SILICATE MINERALS IN UREILITES. J. L. Berkley, Department of Geosciences, SUNY College at Fredonia, NY 14063

Precision electron microprobe analyses of ureilite olivine and pyroxene were performed for the purpose of adding to the database reported in (1). The new analyses (see table) were performed at MIT (Cambridge, MA) and RPI (Troy, NY) using JEOL 733 Superprobes operating at 15kv acc. potential and 200 na beam current. Peaks were counted for sufficient time to achieve 1% st. dev. or a maximum of 600 secs. on both standards and samples. Majalahti olivine was used as an interlaboratory standard for comparison to New Mexico analyses (1).

Discussion. A critical conclusion of (1) regarding ureilite petrogenesis is that ureilites show no geochemical correlations that can be interpretted as showing comagmatic evolution. Furthermore, each ureilite analyzed up to that time by precision techniques was shown to have evolved as part of independent, magmatic bodies. This study was undertaken to see if additional data on other ureilites would give reason to modify that assessment.

In short, the additional data does not justify altering the conclusions noted above. For example, no three-point (or greater) correlations arise in Fig. 1 that could be interpretted as multiple magmas arising by varying degrees of partial melting from the same, plag.-depleted source region (see p. 2265 in 1 for explanation). Thus all analyzed ureilites are derived from somewhat different source compositions.

Fig. 2 is typical compared to similar plots for other minor elements versus *mg* in olivine. No Cr-*mg* correlation exists which shows that comagmatic evolution for these ureilites is unlikely. Of some interest, however, is the wide variation in Cr for iron-rich ureilites compared to more Mg-rich samples, possibly a sampling error (Fe-rich ureilites are more common than Mg-rich varieties). Part of this variation is due to two, closely related, poikilitic ureilites, Y74130 and META78008 (lower left, Fig. 2). These oddballs display anomalously low Cr, but high Mn in olivine, and plot off the linear, reduction-produced ureilite trends on Fe/Cr or Fe/Mn vs. Fe/Mg plots (see 1). For instance, Fe/Cr plots about 4x higher than expected. Note also that Ca/Al is low in both olv and px (poik. opx in both cases; Fig. 3), and calculated CaO/Al_2O_3 in the Y74130 parent liquid is extremely depleted relative to chondritic abundances. Even if this particular calculated liquid composition is in error (due to choice of partition coefs. or analytical error), other elemental abundances and ratios show that these two ureilites belong in a class by themselves as discussed by (2).

The only other anomalous factor introduced by the new data reported here is show in Fig. 3. Hajma shows a deviation from the linear trend of other ureilites suggesting less-than-complete equilibration of olivine with pyroxene in this ureilite.

MINOR ELEMENTS, UREILITES
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High-precision minor elements: UREILITES

Olivine:	84130(3)	Y74130(9)	78008(8)	83225(3)	Y74659(2)
Al2O3	0.027(.0046)	0.141(.100)	0.046(.016)	0.032(.001)	0.026(.0007)
Cr2O3	0.545(.012)	0.436(.030)	0.393(.012)	0.643(.006)	0.528(.009)
MnO	0.513(.014)	0.455(.017)	0.453(.017)	0.500(.004)	0.439(.001)
CaO	0.287(.0056)	0.241(.010)	0.253(.006)	0.358(.004)	0.312(.002)

Olivine:	Hajma(10)	Lahrauli(2)	83014(5)	Marj. std.(6)
TiO2	ND	0.016(.0002)	ND	ND
Al2O3	0.037(.015)	0.032(.002)	0.027(.004)	0.013(.002)
Cr2O3	0.758(.081)	0.698(.007)	0.700(.008)	0.036(.004)
MnO	ND	ND	0.430(.004)	0.305(.006)
CaO	0.390(.028)	0.330(.012)	0.351(.003)	0.020(.004)
Na2O	ND	ND	ND	ND

Pyroxene:	Y74659(3)	Y74130(1)	Hajma(5)	Lahrauli(5)
TiO2	ND	ND	0.068(.003)	0.068(.002)
Al2O3	0.599(.277)	1.727	0.446(.024)	0.688(.038)
Cr2O3	0.815(.011)	1.133	1.065(.009)	1.214(.003)
MnO	0.466(.029)	0.409	0.432(.012)	0.417(.013)
CaO	3.72(.039)	2.184	4.53(.03)	3.94(.016)
Na2O	ND	ND	0.036(.003)	0.095(.005)

NOTE: number in ( ) adj. to name = grains analyzed. Number in ( ) adj. to value = 1-sigma std. dev. ND=not determined.

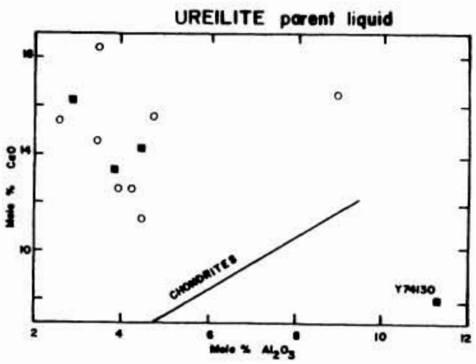

Fig. 1. Calculated CaO/Al2O3 in ureilite parent liquids (method according to 1). Open circles = data from (1); closed squares = this study.

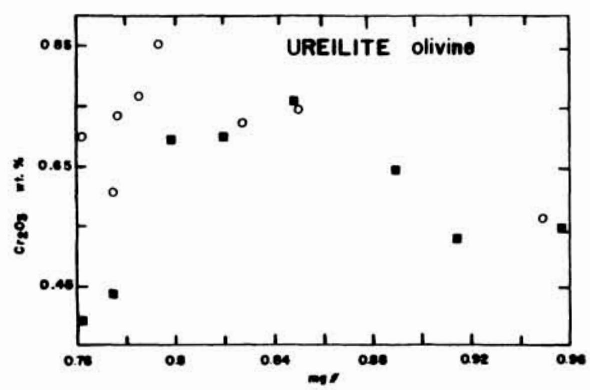

Fig. 2. Cr2O3 vs <u>mg</u> in olivine. Symbols as in Fig. 1.

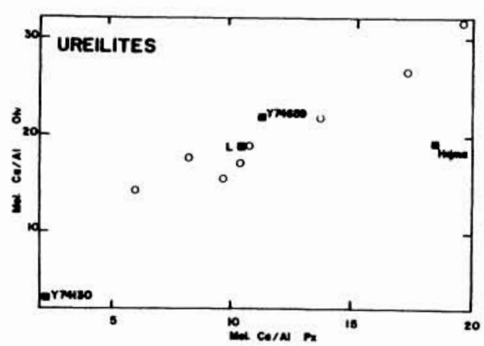

Fig 3. Mol. Ca/Al in Olv vs Ca/Al in Px. Symbols as in Fig. 1.

(1)Goodrich, C.A. et al. (1987) GCA 51, 2255-2273.
(2) Takeda, H. (1987) EPSL 81, 358-370.