

U, Th, Pb AND REE ABUNDANCES AND Pb 207/206 AGES OF
INDIVIDUAL MINERALS IN RETURNED LUNAR MATERIAL BY
ION MICROPROBE MASS ANALYSIS

C.A. Andersen & J.R. Hinthorne, Hasler Research Center,
Applied Research Laboratories, Goleta, CA 93017

*
Ion microprobe analyses of Apollo 11, 12, and 14 material have shown that U, Th, Pb and REE are concentrated in accessory minerals such as apatite, whitlockite, zircon, baddelyite, zirkelite and tranquillityite. Th/U ratios are found to vary by over a factor of 40 in these minerals. K, Ba, Rb and Sr have been localized in a K rich, U and Th poor glass phase that is commonly associated with the U and Th bearing accessory minerals. Li is observed to be fairly evenly distributed between the various accessory phases. The phosphates have been found to have REE abundance patterns (normalized to the chondrite abundances) that are fairly flat, while the Zr bearing minerals have patterns that rise steeply, by factors of ten or more, from La to Gd. All the accessory minerals have large negative Eu anomalies. Radiometric age dates (Pb 207/206) of the individual U and Th bearing minerals within the fine soil material compare favorably with the Pb 207/206 age of the bulk crystalline rocks. The Th/U ratios and Pb isotopic data and the light REE abundance distributions that have been measured in the accessory mineral phases analyzed in this work are summarized in Table 1 and Figure 1, respectively. The ages given are the Pb 207/206 ages. The Pb isotopic data generally have an accuracy of about 5% and the Th/U ratios an accuracy of about 10%. The data will be discussed in detail.

* Ion Microprobe Mass Analyzer, Applied Research Laboratories, Sunland, California

TABLE 1

Th AND U BEARING MINOR MINERAL PHASES
IN APOLLO 11, 12 AND 14 LUNAR MATERIAL

<u>Sample</u>	<u>Min. Phase</u>	<u>Th/U</u>	<u>Pb²⁰⁸/206</u>	<u>Pb²⁰⁷/206</u>	<u>Age (b.y.)</u>
10085/7-6	Ti, Zr Silicate	2.16	0.59	0.40	3.97
10085/17-26	Zr O ₂	0.49	0.133	0.455	4.18
12032, 46-2	Zircon	0.79	0.294	0.408	4.01
12013, 14	Zircon	0.48	0.144	0.483	4.25
12013, 14	Zr Phase in K Vein	1.22	0.381	0.414	4.03
12013, 14	Whitlockite	20.4	3.64	0.49	4.26
14257, 3-109B	Zirkelite	1.55	0.383	0.412	4.03
14257, 3-109B	Zirkelite	1.73	0.374	0.425	4.07
14163, 86-A4	Zr O ₂	-	0.34	0.406	4.00

