Pb ISOTOPIC AGE OF ALM-A – A FELDSPAR-RICH VOLCANIC ROCK FROM THE CRUST OF THE UREILITE PARENT BODY.

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Introduction: ALM-A (Almahata Sitta trachyandesitic meteorite) is a 24.2 gram SiO_2-rich volcanic rock from the Almahata Sitta fall [1]. It is composed mainly of feldspar and Ca-rich and Ca-poor pyroxene [2,3]. Its affinity to ureilites is shown by O isotopic composition and mineralogy [3] and, therefore, this rock is thought to derive from the crust of the ureilite parent body.

A ^{26}Al-^{26}Mg age of ALM-A was determined from multiple ion microprobe analysis of feldspar grains, which yielded an initial $^{26}Al/^{27}Al=1.1\pm0.4\times10^{-7}$ [3], corresponding to an age of 6.5 Ma after CAI formation. This age is meaningful only if, at the time of CAI formation, the initial $^{26}Al/^{27}Al$ of the ureilite precursor material was the same as that of CAIs. Furthermore, the feldspar grains from ALM-A analysed for ^{26}Al-^{26}Mg show no correlated variations in Al/Mg and $^{26}Mg/^{24}Mg$ ratios [3], hence the ^{26}Al-^{26}Mg age is a model date, and as such is not as reliable as isochron ages.

Here we use Pb-isotopic data to independently constrain the crystallization age of ALM-A. Additional U-Pb analyses, as well as U isotopic and ^{182}Hf-^{182}W studies are in progress.

Techniques: A 3.3 mg pyroxene-rich fraction and a 9.5 mg whole rock fraction with fragment size between 100 and 250 μm were leached in 0.5M HNO_3 (W1), 7M HNO_3 (W2), 6M HCl (W3) and 0.5M HF (W4), and dissolved in concentrated HF+HNO_3 (R). The leachates and residues were spiked, dissolved and analysed following [4]. The accuracy of analyses was verified by analyses of the synthetic EarlyTime ET1x solution that simulates isotopic composition of ancient radiogenic Pb [5,6]. This report is based on Pb isotopic analyses of HCl and HF washes and residues. The analyses of the HNO_3 washes and U concentration measurements are in progress.

Results: The HCl and HF washes from pyroxene and whole rock fractions contain moderately radiogenic Pb with $^{206}Pb/^{204}Pb$ between 32 and 42. The residues contain less radiogenic Pb with $^{206}Pb/^{204}Pb$ of 27.3 (pyroxene) and 11.9 (whole rock). A $^{207}Pb/^{206}Pb$ vs. $^{204}Pb/^{206}Pb$ isochron regression through five data points (all except pyroxene residue) yields an age of 4562.0±3.4 Ma (MSWD=5.1), assuming $^{238}U/^{235}U=137.79$. The isochron passes through the isotopic composition of the primordial Pb, signifying the absence of terrestrial contamination.

Discussion: The Pb-isotopic isochron age of ALM-A corresponds to formation of this rock at 5.3±3.4 Ma after CAIs [7]. It confirms the ^{26}Al-^{26}Mg age of the same rock [3], and agrees with ^{26}Al-^{26}Mg and ^{53}Mn-^{53}Cr ages of other ureilites [8]. The consistency with the ^{182}Hf-^{182}W ages of ureilites [9] suggests that crust formation on the ureilite parent body occurred shortly after mantle differentiation.

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