LEAD ISOTOPIC AGE OF THE QUENCHED ANGRITE NORTHWEST AFRICA 1296.

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Introduction: Northwest Africa 1296 [1] is a quenched angrite with similar composition to the quenched angrites D'Orbigny and Sahara 99555 that were dated with the Pb-Pb method at 4564.42 ± 0.12 Ma [2] and between 4564.58 - 4564.86 Ma [3,4], respectively (dates calculated with $^{238}U/^{235}U$=137.88). Here we describe the Pb-isotopic systematics of the angrite NWA 1296. Determination of U-Pb ratios is in progress.

Techniques: NWA 1296 is a very fine-grained rock, therefore separation of minerals by hand picking, as was done for other coarser-grained angrites, was impractical. Instead, we focused on separation of minerals on the basis of solubility in acids. Various size fractions of crushed sample were gently leached in 0.5M HNO_3 or 0.3M HBr (first leachates) in order to extract phosphate minerals, then leached in hot concentrated HNO_3 and HCl (second leachates), dissolved and analyzed following [5].

Results: Residues after acid leaching of NWA 1296 whole rock contain 9-17 ppb Pb – lower than in D'Orbigny (18-30 ppb) and Sahara 99555 (27-34 ppb). The measured $^{206}Pb/^{204}Pb$ ratios are between 280-1150 (330-4990 after blank subtraction). The six most radiogenic analyses with blank-corrected $^{206}Pb/^{204}Pb$>1000 yield consistent $^{207}Pb/^{206}Pb$ dates with a weighted average of 4564.20±0.45 Ma, MSWD=0.89 ($^{238}U/^{235}U$=137.88). These analyses yield uniform $^{232}Th/^{238}U$ model ratios of 8.87±0.05 (2 SD). Less radiogenic residue analyses are more dispersed, probably due to the presence of two non-radiogenic Pb components.

The first and second leachates contained 200-600 ppb and 23-75 ppb Pb, respectively. Lead in the leachates (with $^{206}Pb/^{204}Pb$ up to 174 in the first leachates and up to 725 in the second leachates) is sufficiently radiogenic to attempt age calculation. The $^{232}Th/^{238}U$ model ratios in the leachates are uniform (3.78±0.04 in the first leachates, 3.70±0.15 in the second leachates) and distinct from the value in the residues, suggesting that most U in the rock is contained in one moderately soluble mineral, or in two minerals with different solubility but similar Th/U ratios. A combined Pb-Pb isochron for the first and second leachates yields 4565.13 ± 0.55 Ma, MSWD=92. The isochron passes between the points for primordial Pb and modern crustal Pb, implying the presence of two non-radiogenic Pb components.

Discussion: The residue model age of 4564.20±0.45 Ma gives a minimum estimate of the crystallization age. This value is consistent with the ages of D'Orbigny and Sahara 99555. The distribution of Th/U model ratios between soluble and insoluble minerals is also similar among these meteorites. These observations further support their close genetic connection.

Interpretation of the leachate isochron date depends on identification of the principal U-carrying mineral in NWA 1296. If U is contained in a Ca-phosphate such as merrillite, apatite or silico-apatite, then the isochron date corresponds to the closure of radiogenic Pb migration in this mineral. Comparison of the residue and leachate dates indicates very rapid cooling, which can be estimated quantitatively if the dates are better constrained, and the grain size of the U-carrying mineral is determined.

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