ANOTHER STAB AT PRIMORDIAL LEAD

F. Albarède[1], J. Blichert-Toft[1], D. S. Ebel[2], and B. Zanda[3]. [1]Ecole Normale Supérieure de Lyon, 69007 Lyon, France (albarede@ens-lyon.fr). [2]American Museum of Natural History, New York, NY 10024, USA. [3]Muséum National d'Histoire Naturelle, 75005 Paris, France.

Introduction: Very few measurements of natural properties have stood the test of time as well as the isotopic composition of the Solar System primordial Pb as hosted by Canyon Diablo troilite and analyzed by Patterson [1]. Later studies [2-5] improved the precision of the original estimate, yet failed to demonstrate that Pb less radiogenic than that of Canyon Diablo could actually be isolated from meteorites. Motivated by the newly achieved precision of MC-ICP-MS, we adopted the standard strategy of sequential leaching to measure Pb isotope compositions in a number of troilite samples. We present new data showing that Pb in troilite from Canyon Diablo, Mundrabilla, Nantan, Seeläsgen, Toluca (IAB-IIICD), Cape York (IIIA), Seymchan (pallasite), and Mt Edith (IIIB) contains a very unradiogenic component.

Results: Despite some isotopic variability in troilite within a same meteorite, our data are consistent with literature results: the least radiogenic values were obtained for Nantan (Table 1), almost within error of the original Canyon Diablo values. These two meteorites contain the most primordial Pb so far observed in the Solar System, probably because of their high Pb contents.

Discussion: We explored a new approach inspired from Stacey and Kramers [6]: if a unique primordial Pb component is present in all troilite material, all mixing lines and isochrons should converge towards the primordial value. Statistical tests on slopes and intercepts show that this is indeed the case, in particular for uranogenic Pb. Lead from Canyon Diablo, Nantan, Cape York, Seymchan, and Mundrabilla tightly defines a common isotopic composition (Table 1). Literature TIMS data for Canyon Diablo, Toluca [4] and Cape York [5] fall on the same alignment as our MC-ICP-MS data. The intersection values are more radiogenic than those of the most primitive leachates of Nantan and Canyon Diablo by 3.0‰ per amu. The Pb isotope composition derived by the present intersection method may more accurately represent the primordial Pb of the Solar System than those of extreme leachates taken at face value. However small the difference may be, it will significantly affect the 'Canyon Diablo' Pb-Pb ages of meteorites, in particular for the least radiogenic samples.

Table 1. Estimates of the isotope composition of primordial Pb.

	$^{204}Pb/^{206}Pb$	$^{207}Pb/^{206}Pb$	$^{208}Pb/^{206}Pb$
Nantan (this work)	0.10739(3)	1.10758(16)	3.1732(4)
Canyon Diablo [2]	0.10745(3)	1.1060(5)	3.1671(14)
Intersection	0.10675(56)	1.1041(27)	3.159(3)

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