INDUCTIVELY COUPLED PLASMA MASS SPECTROMETRY MEASUREMENTS OF BULK MERCURY ABUNDANCES AND ISOTOPIC RATIOS IN MURCHISON (CM) AND ALLENDE (CV). D. S. Lauretta[1], B. Klaue[2], J. D. Blum[2], and P. R. Buseck[1], [1]Department of Chemistry & Biochemistry, Department of Geology, Arizona State University, Tempe AZ 85287-1604, USA (lauretta@asu.edu), [2]Department of Geological Sciences, University of Michigan, 425 E. University Avenue, 4015 CC Little Building, Ann Arbor MI 48109, USA.

Introduction: There have been numerous studies of the abundance and isotopic composition of Hg in meteorites [1]. Measurements of bulk Hg abundances in many meteorites scatter by more than 3 orders of magnitude. In addition, there are many reports of isotopic anomalies in meteoritic Hg.

Every report of isotopically anomalous Hg in meteorites is based on neutron activation analysis. This technique is capable of measuring low concentrations of Hg (ng/g) but can only detect two of the seven stable isotopes. As a result only anomalies in the ^{196}Hg/^{202}Hg ratio have been reported.

Even though the reported anomalies are controversial, the possibility of mass fractionation of Hg isotopes can not be ruled out since it is a highly volatile element and its stable isotopes span a relatively large mass range (196–204). Natural fractionation of Hg isotopes has been reported in a series of hydrothermal cinnabar samples [2] and in lake sediments and related organisms [3]. Thus, signatures of low-temperature events in the solar nebula and on meteorite parent bodies may be recorded in the fractionation of Hg isotopes.

If there truly is a variation in the isotopic composition of meteoritic Hg, then it should be apparent in the other five stable isotopes. Recent advances in the ability of inductively coupled plasma mass spectrometry (ICPMS) coupled with cold-vapor generation to simultaneously measure low concentrations (pg/g levels) and isotopic abundances of Hg with a precision of ±0.005–0.02% (depending on Hg concentration) and free from the interferences inherent in INAA led us to reevaluate the question of Hg in meteorites. We began with two well-studied carbonaceous chondrites: Murchison (CM) and Allende (CV), both of which reportedly contain isotopically anomalous Hg [4–6].

Experimental Techniques: For the bulk concentration analyses, an "ELEMENT" (Finnigan MAT) single-collector magnetic-sector ICPMS was employed. The continuous-flow, cold-vapor-generation apparatus consists of a variation of the gas-liquid separator described by [7]. The isotopic analyses were performed by coupling the gas-liquid separator to a "P54" (VG Elemental Inc.) MC-ICPMS. This instrument is equipped with 9 Faraday cups so that all 7 Hg isotopes and two isotopes of an external standard (^{203}Tl and ^{205}Tl) can be analyzed simultaneously. For the analysis of the isotopic composition we used purified elemental Hg from the Almaden mine in Spain as a relative "zero" fractionation standard.

Results: The bulk abundances of Hg are 294±15 ng/g in Murchison and 30.0±1.5 ng/g in Allende. Previous studies suggest that both meteorites contain isotopically anomalous Hg with δ^{196}Hg $\left(\equiv\left[\frac{(^{196}\mathrm{Hg}/^{202}\mathrm{Hg})_{\mathrm{sample}}}{(^{196}\mathrm{Hg}/^{202}\mathrm{Hg})_{\mathrm{standard}}}-1\right]*1000\right)$ values for bulk samples ranging from –13 to +77 in Murchison and from –142 to +5 in Allende. Our measurements suggest that the relative bulk abundances of all seven stable Hg isotopes in both meteorites are identical to terrestrial values within 0.7‰. Experiments are planned to measure the variation in the isotopic composition of Hg released from the meteorites at increasing temperatures.

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