CHRONOLOGY OF IAB IRON METEORITES USING THE Pd-Ag DECAY SYSTEM.

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Introduction: Iron meteorites are generally thought to originate as remnants of iron cores from differentiated parent bodies. However, IAB's do not fall into this category as they consist of a heterogeneous mix of different composite inclusions and fractionated metals [1]. This makes it difficult to accurately determine their origin. Although numerous ideas were put forward to adequately explain their heterogeneity, the most recent theories include a history of partial melting, differentiation and metamorphism followed by total disruption of parent body and re-accumulation [1,2]. Various dating techniques have been applied to determine the timing of these processes. For example, the Hf-W decay system yields an age of 1.8 (+2.3/-2.0) Ma relative to CAI for metal/silicate fractionation on the IAB parent body [3], whereas Ar-Ar dating of mineral separates from silicate inclusions supports a catastrophic break up and re-assembly of the parent body at ~4.5-4.47 Ga, indicating a complex thermal history [4]. The Pd-Ag short-lived decay system (half-life of ~6.5 Myr) can be used to determine the timing of early metal crystallisation processes [5-7], because the siderophile Pd and chalcophile Ag fractionate during core crystallisation. This study aims to apply the Pd-Ag chronometer to different IAB's to date the last metal crystallisation episode thereby providing further constraints on the history of the IAB parent body.

Samples and Analytical technique: Ion exchange chemistry [5] has been used to separate Pd and Ag from Toluca, Caddo County, Campo del Cielo and Goose Lake. Samples were analysed on a Nu Plasma MC-ICP-MS relative to the NIST SRM978a Ag standard to obtain their Ag isotope composition and $^{108}Pd/^{109}Ag$ ratios. Further samples of Canyon Diablo, Odessa and a duplicate Goose Lake will be measured.

Results and discussion: The new IAB metal data define a best fit line with a slope of 1.24 (±0.4) x 10^{-5} in a Pd-Ag isochron diagram. Previous Pd-Ag data for IAB metal fall on our best fit line [6,7]. The slope corresponds to an age of ~14.6 (+6.7/-7) Ma after CAI formation, using the initial ^{107}Pd abundance of the solar system obtained from carbonaceous chondrites [5]. The resulting Pd-Ag age is in good agreement with Hf-W and I-Xe ages of (10.8 +2.4/-2.0) [3] and (10-20Ma) [4], respectively, obtained for some of the IAB silicate inclusions. The Pd-Ag age characterizes the time when IAB metal reached closure temperature for Pd and Ag. Since it is difficult to see how metal and silicates can mix without re-setting the Pd-Ag system, this age must be relatively close to the time when metal and silicates were mixed.

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