Pd-Ag chronology of IVB iron meteorites

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The IVB iron meteorites are the most strongly volatile-depleted iron meteorites and therefore exhibit extremely high Pd/Ag ratios. As such these samples can be precisely dated using the short-lived ^{107}Pd-^{107}Ag system ($t_{1/2}$ = 6.5 Ma). The dominant processes leading to Pd/Ag fractionation are metal-sulfide partitioning and volatile depletion [1]. Thus, the Pd-Ag systematics can be used to constrain not only the cooling timescale of the IVB core, but also the timescale and processes of volatile depletion. However, the application of the Pd-Ag system to IVB irons is severely complicated by large neutron capture-induced shifts in ^{107}Ag/^{109}Ag, resulting from the extended exposure of the IVB irons to galactic cosmic rays (GCR) [2]. We have recently developed a method to correct for GCR-effects on Pd-Ag isotope systematics using Pt isotopes as a neutron dosimeter [3]. Here we present new Pd-Ag and Pt isotopic data for several metal pieces of the IVB iron Dumont, with the ultimate goal to constrain the volatile depletion and cooling history of the IVB parent body. After correction for GCR effects, the analyzed metal samples define a Pd-Ag isochron, corresponding to an age of ~7 Ma after the IVA iron Muonionalusta [3]. Of note, core formation in the IVB parent body occurred about ~2 Ma later than in the IVA parent body [4], consistent with the younger Pd-Ag cooling age of the IVB irons. The initial ^{107}Ag/^{109}Ag obtained from the Dumont isochron is elevated compared to chondrites and the terrestrial standard, but given the exceedingly high Pd/Ag of the IVB irons, points towards a relatively late Ag loss from the IVB core. Possible processes that account for such a late loss are impact volatilization or removal of a S- and Ag-rich melt during crystallization of the core. A corollary of this is that the Ag-depleted nature of the IVB irons may not only reflect volatile depletion, but also later processes during parent body differentiation.

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