Insights on late accretion from platinum metal-silicate partitioning

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The mantle's platinum (Pt) signatures are thought to preserve evidence of core-mantle segregation [1] and a late veneer accretion [2]. The metal-silicate partitioning behavior of Pt during accretion is therefore a key probe of the mantle's pre-late veneer composition and of the late veneer mass. To place further constraints on these processes, Pt partitioning coefficients were measured at pressures (40 to 110 GP) and temperatures (3600 to 4300 K) directly relevant to core-mantle equilibration [3]. Experiments were done in laser-heated diamond anvil cells and the composition and fine structures of the samples were analyzed by NanoSIMS and transmission electron microscopy. These probes have the relevant spatial and analytic resolution to resolve issues related to nanonuggets and low Pt solubility in silicates [4]. The measured partitioning coefficients are well correlated with lower P-T measurements [4]. When these results are applied to a multi-stage accretion model, we find that equilibration at deep magma ocean conditions could produce the observed Pt content of the mantle. Considering this significant Pt leftover from core formation, the addition of a maximum of 0.35 % Earth mass of late veneer could satisfy both the Pt and other HSEs contents of the present mantle [2]. A mechanism to remove excess platinum from the mantle to the core such as sulfide segregation [5] or self-oxidation [6], could also reconcile these results with the geochemical observations. **Ref:** [1] Creech et al, GPL 94-104, 2017 [2] Walker, Chemie der Erde, 69, 2, 2009 [3] Siebert et al, EPSL, 321-322, 189-197, 2012 [4] Bennett et al., GCA, 167, 422-442, 2014 [5] Rubie, Science, 353, 6304, 2016, [6] Frost, *Nature* 428, 409 (2004)