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The abundances of siderophile elements in the Earth's mantle are an imprint of the core formation in the early Earth. Thermodynamic expressions used to constrain the metal-silicate partitioning behavior of siderophile elements are mainly established from large volume press experiments that do not cover the predicted P-T space for core-mantle equilibrium. Diamond anvil cell is the only static technique capable of achieving required P-T conditions but until now it's capabilities to perform quantitative metal-silicate partitioning experiments at extreme conditions has been untapped. We use protocols that effectively link high P-T diamond anvil cell with analytical techniques such as focused ion beam device (FIB); NanoSIMS; electron microprobe; transmission electron microscopes; and *in-situ* synchrotron X-ray diffraction measurements allow us to obtain quantitative data on element partitioning at superliquidus conditions above 30 GPa and 3000 K. Here we present our advances in both experimental and analytical methods. We look at the partitioning of 6 siderophile elements (Ni, Co, Cr, V, Mn, and Nb) that have been extensively studied at lower P-T conditions and constrain the solubility of light elements (Si and O) at these extreme conditions. We then update expressions that describe the partitioning behaviors of these elements to address the validity of main proposed core formation models (*i.e.* single-stage core formation model and continuous core formation model).

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