Investigating element partitioning in deep mantle using large sintered diamond anvils

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Chemical composition changes in coexisting mantle phases as a function of depth are controlled by element partitioning. The mineral chemistry is essential for modeling density and velocity profiles of the mantle that can be directly compared with the seismic observations. In this study, I investigate element partitioning among bridgmanite, ferropericlase, and Ca-perovskite in a peridotitic composition along a model geotherm up to a depth of 1200 km. The experiments are conducted in the multi-anvil device, using newly developed large sintered-diamond anvils. The experimental pressure is crosschecked with known transitions associated with electrical resistance changes in Zr and $BiFeO_3$, and the Al solubility in bridgmanite up to 50 GPa. The chemical compositions of the coexisting phases are determined with a field-emission electron microprobe. I further examine the interaction between peridotite and basalt in deep mantle to gain insight into the fate of subducted basaltic crust in the middle mantle.