

## Controls on orthopyroxene-melt partitioning of palladium

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Whereas there is a reasonable experimental and observational database for assessing the roles of olivine and chromite in controlling the behaviour of the platinum group elements (PGE) during melting and solidification, other phases, such as pyroxene, have gone largely uncharacterized. The role of orthopyroxene (opx) is of particular interest, given its significant modal abundance in terrestrial, mantle-derived rocks, and with the recent discovery of opx-dominated debris in material derived by possible impact excavation of the lunar mantle. Past work on olivine-melt partitioning has shown the compatibility of Ru, Rh and Ir as the divalent species substituting for Mg in VI-fold coordination, and similar behaviour is expected for opx. In contrast, Pd was shown to be highly incompatible in olivine, owing to the predominance of Pd<sup>1+</sup> at low fO<sub>2</sub>, resulting in both size and charge mismatch with Mg. Unlike olivine, opx can incorporate 1+ species, notably Na, in couple substitutions involving Al and Fe<sup>3+</sup>, allowing for enhanced uptake of Pd into the opx structure. Also, the estimated ionic radius for Pd<sup>1+</sup> is similar to Na<sup>1+</sup>, and therefore opx-melt partitioning of the two elements should be similar.

To verify these predictions, experiments are in progress to measure opx-melt partitioning of Pd at controlled fO<sub>2</sub> and 0.1 MPa. Experiments employ the RP2+Na composition of previous work, which saturates in opx-only at 0.1 MPa and ~1400°C. Samples are suspended within a vertical tube furnace from Fe-saturated Pd loops, and subject to slow cooling (1-60 deg/hr) from 1400-1340 °C, then a 48 hr soak, prior to quenching in water. Oxygen fugacity (fO<sub>2</sub>) is controlled by CO-CO<sub>2</sub> mixtures, and glasses and crystals are measured for Pd by LA-ICPMS. Preliminary measurements of the opx-melt D<sub>Pd</sub> show an overall increase with decreasing fO<sub>2</sub>, with values similar to olivine at FMQ+5, but diverging to higher than olivine at FMQ-1. These results are consistent with predictions, reflecting the dominance of Pd<sup>2+</sup> at high fO<sub>2</sub>, and therefore similar substitution for Mg in olivine and opx, with the divergence in behaviour consistent with the coupled substitution of Pd<sup>1+</sup> into opx, as the reduced species becomes more abundant.