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# Impact of hydration on majoritic-garnet equation of state

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## Abstract:

The mantle transition zone (TZ) is believed to be primarily composed of three constituents: wadsleyite, ringwoodite, and majoritic-garnet (Anderson and Bass, 1986; Irifune, 1987). Constraints on compositional models of the TZ rely on knowledge of the equations of state for component minerals. Over the TZ pressure range, 13-24 GPa, the dissolution of pyroxene gradually increases with pressure resulting in a complex chemical composition of majoritic-garnet which varies with depth and ranges from majorite (Mj), $Mg_4Si_4O_{12}$, to pyrope (Py), $Mg_3Al_2Si_3O_{12}$ (Gasparik, 1989). Previous equation of state studies have been performed with samples along the majorite-pyrope solid solution (Wang et al. 1998; Sinogeikin et al. 1996; Yagi et al. 1992) however few have considered both composition and hydration under the high pressure conditions of the mantle transition zone.

We are investigating the influence of hydration on majoritic-garnet with compositions ranging from $Py_{95}Mj_5$ to $Py_{18}Mj_{82}$ and containing 120-2200 ppm water by weight (Thomas et al. 2015). We will present results from high-pressure X-ray diffraction experiments collected on beamline 13-BM-C of GSECARS up to 25 GPa with emphasis on structure and equations of state. Results of this study will ultimately improve models of the composition and hydration state of the mantle transition zone.

References

Thomas, S.M. et al. (2015) Am. Mineral. 100, 1084-1092.