

Temporal stability and pressure calibration of barium carbonate and talc/pyrex pressure media in a piston-cylinder apparatus

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ABSTRACT

New melting experiments in a 0.5 inch piston-cylinder apparatus from 0.5 to 3.0 GPa on compositions along the diopside-wollastonite join show that the eutectic liquid composition, which varies with pressure, does not change with time in experiments with barium carbonate or with talc/pyrex pressure media. Mapping out the trace of the diopside-wollastonite eutectic curve in P - T space with both piston-in and piston-out experiments reveals high-temperature pressure intensification in piston-in experiments with barium carbonate or talc/pyrex assemblies, in contrast to frictional loss of pressure at lower temperatures. A new pressure correction algorithm, derived by multiple regression analysis, incorporates both effects. When applied to a barium carbonate experiment at the intersection of the CMAS spinel-lherzolite to garnet-lherzolite transition (SGT) with the model peridotite solidus, the model pressure increases from 2.25 to 2.82 GPa. When a similar type of correction is applied to piston-out experiments run in talc/pyrex assemblies, the pressure of the intersection of the SGT and the CMAS solidus decreases from 3.0 to ~2.9 GPa, in agreement with the barium carbonate experiments from this study and with experiments from other studies run with salt/pyrex assemblies.