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Thermodynamic properties of stishovite by heat capacity measurements and the coesite-stishovite transition boundary

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Stishovite is one of important minerals in science of the earth's mantle, and the coesite-stishovite transition boundary is widely used for pressure calibration at high temperature. The low-temperature isobaric heat capacity (Cp) of stishovite synthesized at 15.5GPa and 1400oC was measured between 2.3 and 311.4 K by thermal relaxation method using a PPMS. The measured Cp was considerably smaller than that by Holm et al. (1967) in the whole temperature range studied. The standard entropy, So298., of stishovite obtained is 24.0 J/mol.K, which is 3.8 J/molK smaller than that by Holm et al. (1967). Using the measured Cp, Debye temperature and thermal Gruneisen parameter at 298 K were calculated to be 1109 K and 1.68, respectively. The equilibrium coesite-stishovite transition boundary was calculated using the So298 of stishovite with published thermodynamic data including enthalpy of transition by Akaogi et al. (1995). The calculated boundary has a slope of 3.2?0.1 MPa/K at 1200-1600 K which is larger than the slope determined by high-pressure in situ X-ray diffraction study by Zhang et al. (1996).

Keywords: stishovite, thermodynamic property, heat capacity, coesite-stishovite transition