

Density determination of fluid inclusions using micro Raman spectroscopy: a new probe for the deformation of mantle minerals

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Internal pressure of CO₂ fluid inclusions in mantle-derived xenoliths can disclose the deformation processes of mantle minerals. We developed a new method for determining density of CO₂ inclusion by using micro Raman spectroscopy. This method can determine the density of CO₂ inclusion with a spatial resolution of 1 micron and a very wide range from 0.1 to 1.21 g/cc. We obtained a reliable calibration of Raman densimeter by in-situ observation of Raman spectra of CO₂ at high pressure using a high-pressure cell.

We investigated density of CO₂ inclusions in spinel lherzolite from Far East Russia and granulite and spinel lherzolite from Oki-Dogo, Japan. By comparing these samples, we discuss the depth where mantle xenoliths were entrained into magma, the extents of plastic deformation and cooling history of xenoliths.