“High-pressure infrared spectroscopy in Geosciences”

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Abstract

IR spectroscopy has important applications in a range of scientific disciplines, from chemistry to material sciences and geosciences. IR spectroscopy can be readily combined with spectroscopic cells such as diamond anvil cells to explore the physical and chemical properties of candidate earth materials at high pressure and temperature conditions. This contribution will review applications of (synchrotron) infrared spectroscopy in Earth Sciences. Discussed examples will include 1) the calibration of water solubility in mantle minerals and the behavior of hydrous minerals at high pressures to better constrain the deep water cycle; 2) solubility and speciation of volatiles (namely H_2O and CO_2) in silicate melts to elucidate the dynamics of magma chambers; 3) calculations of fluid-mineral isotopic fractionation ratios to track fluid processes in subduction zones; and 4) measurements of the radiative conductivity of deep mantle minerals.