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Single-crystal Brillouin Spectroscopy with Laser Heating and Variable q: Design and Results on Olivine
Single-crystal Brillouin Spectroscopy with Laser Heating and Variable q: Design and Results on Olivine

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We have developed a novel Brillouin spectroscopy system integrated with CO2 laser heating and Raman spectroscopic capabilities. High-pressure laser heating experiments on liquid water compressed in a diamond-anvil cell up to 2500 +/- 150 K demonstrate the flexibility and performance of the system. Temperature is determined from the grey-body thermal radiation of the heated samples. New single-crystal laser heating Brillouin measurements were made on San Carlos Olivine in the (111) plane at pressures up to ˜13 GPa, and T=1300K. We obtain quantitative values for the thermal pressure in the diamond cell. Using KCl and KBr and pressure-transmitting media, we show that pressure gradients in the sample chamber are small at high P-T conditions based on observations of the olivine-wadsleyite transition. This system is additionally designed for continuously varying scattering angles from near forward scattering (0o scattering angle) up to near back scattering (˜141o). Our results on the sound velocities of olivine at high pressure-temperature conditions have implications for the nature of the 410 km discontinuity and the olivine content of the transition zone.

キーワード: Elastic properties, Brillouin scattering, Equations of state, Olivine
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