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Raman spectroscopy of $CaIrO_3$ postperovskite up to 30 GPa

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ABSTRACT

We have measured Raman spectra of the postperovskite (PPv) phase in $CaIrO_3$ up to 30 GPa to constrain the Grüneisen parameter (γ). We identified a total of 4 strong modes between 200 and 650 cm^{-1}, which is in contrast with the Raman spectra of Mn_2O_3 and $MgGeO_3$-PPv where at least nine different modes have been detected. We found no sign of a phase transition in the Raman spectra of PPv $CaIrO_3$, which supports the stability of the PPv phase up to 30 GPa and room temperature in $CaIrO_3$. The spectroscopic Grüneisen parameter, $\gamma_{sp,0} = 1.66\sim1.72$, constrained from our Raman data, is in excellent agreement with the thermodynamic Grüneisen parameter, $\gamma_{th,0} = 1.75 \pm 0.05$, calculated from recent XRD measurements (Martin et al. 2007) on $CaIrO_3$-PPv synthesized at high pressure and temperature similar to our starting material. Our result suggests that γ_{sp} constrained by Raman measurements provides a reasonable estimate on the γ_{th} of the PPv phase in $CaIrO_3$.

Keywords: Postperovskite, $CaIrO_3$, Gruneisen parameter, Raman sepctroscopy, thermal equation of state