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Anisotropic Raman Spectroscopy of Few-Layer Phosphorene[1]
YUCHEN DU, WANGRAN WU, JESSE MAASSEN, ZHE LUO, MARK LUNDSTROM, XIANFAN XU, PEIDE YE, Purdue Univ — Much recent research of black phosphorus (BP) and phosphorene has been focused on their unique anisotropy of this novel 2D material in terms of electrical, optical and thermal properties. Here we report the emerging Raman spectroscopy measurements of BP with respect to its isolation from bulk BP down to single layer phosphorene. The found frequency shift of BP in Raman spectra is to be correlated with atomic motion of modes, which can be explained by applying classical model of coupled harmonic oscillators. Raman intensity of different modes has also been included in our studies, which is confirmed as a solid strategy to quickly determine BP layer thickness. In addition, more information of their mechanical properties can also be obtained from Raman spectroscopy.

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