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Detailed Study of the Raman Response of Mono- and Few-Layer $\mathbf{ReS_2}$ AMBER MCCREARY, Penn State University, National Institute of Standards and Technology, JEFFREY SIMPSON, Towson University, National Institute of Standards and Technology, YUANXI WANG, Penn State University, DANIEL RHODES, Florida State University, KAZUNORI FUJISAWA, Penn State University, LUIS BALICAS, Florida State University, MADAN DUBEY, U.S. Army Research Laboratory, VINCENT CRESPI, MAURICIO TERRONES, Penn State University, ANGELA HIGHT WALKER, National Institute of Standards and Technology — ReS_2 is an exciting 2-Dimensional (2-D) material due to its strong in-plane anisotropy, offering an additional physical knob to tune its properties for a wide variety of applications. In addition, ReS_2 has been shown to be a direct-gap semiconductor for few-layer thicknesses, which is a major advantage in optoelectronics. Raman spectroscopy serves as the most useful, facile, and non-destructive method to characterize ReS_2. Due to its lower symmetry, the Raman spectrum of ReS_2 is significantly more complicated than its Mo or W counterparts, displaying 18 first-order modes. We will discuss the effects on the Raman spectrum under various experimental conditions, including polarization-dependent, layer-dependent, and resonant Raman, and outline the many aspects that need to be considered when using Raman spectroscopy to characterize ReS_2 and other anisotropic 2-D materials. Comparisons between experiments and DFT calculations will also be analyzed. Furthermore, we will demonstrate the importance of correctly calculating thin film interference effects for Raman of ReS_2 on SiO_2/Si substrates.

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