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Experimental artifacts influencing polarization sensitive magneto-Raman spectroscopy

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— Since the discovery of graphene, there has been an explosion of research on 2D layered materials such as transition metal dichalcogenides (TMDs). Among several experimental techniques utilized for studying these materials, Raman spectroscopy has proven to be a very powerful tool due to it's sensitivity to layer numbers, interlayer coupling etc. Layered MoS_2, member of TMD family, is a typical example with promising applications in nano-optoelectronics. A recent magneto-Raman investigations on MoS_2 published by J. Ji *et al* reported an observation of giant magneto-optical effect [PNAS **113**, 2349 (2016)]. In this work, the intensity of Raman modes exhibited dramatic change in intensities and was attributed to field-induced broken symmetry on Raman scattering cross-section. Due to the ambiguous nature of the interpretation presented in this publication, we performed further Raman studies on MoS_2 at high magnetic fields to illustrate the experimental factors overlooked by the previous study. It is highly important to consider the magnetic field-induced rotation of the polarization of the light and its effect on the Raman active phonon modes in anisotropic materials. A detailed report of our magneto-Raman experiments and their outcomes will be presented.

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