PROSPECTS OF CRYOMAGNETIC SPECTROSCOPIES ON VAN DER WAALS MATERIALS USING CHIRAL LIGHT

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Van der Waals (vdW) materials and their heterostructures exhibit remarkable electronic and optical properties that can be finely tuned using external physical fields such as photonic, magnetic, electric, and strain, or through proximity effects with other materials and molecules. These attributes position them as superior building blocks for cutting-edge optoelectronic and spintronic devices. Raman (Ra) and photoluminescence (PL) micro-spectroscopies stand out as pivotal tools for delving into the electronic, optical, and spin phenomena within vdW and their heterostructures. Leveraging light with intrinsic chirality, these spectroscopic techniques offer a window into spin and valley-driven physics across diverse 2DMs. Of particular significance, Ra and PL spectroscopies facilitate the exploration of magnetic order and quantum phenomena in van der Waals materials, owing to the robust spin-lattice coupling. Notably, recent advancements have unveiled the potential of the Ra/PL microscopy in elucidating magnetization reversal and magnetic domain mapping in various 2D magnets and their heterostructures under applied magnetic fields. In this presentation, I will showcase selected findings from helicity-resolved cryomagnetic spectro-microscopies conducted on prominent 2DMs, shedding light on their intriguing properties and potential applications.