Anisotropic optical response and emergent chirality in van der Waals arsenic trisulphide homostructures

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The growing family of van der Waals crystals is recognized as a promising platform for the investigation of novel effects and creation of a variety of functional devices. The nature of their out-of-plane bonds that are stacking the comprising two-dimensional layers, *i. e.*, their explicit layered structure, instantly suggests the emergence of anisotropic properties. Furthermore, the subfamilies of van der Waals crystals that also naturally possess in-plane anisotropic electronic, optical and mechanical properties, appear more interesting as they significantly enrich the research scope [1]. Though the nature of in-plane bonds in constituent two-dimensional layers of van der Waals crystals is covalent, in view of anisotropic optical properties, their low-symmetry crystal structures establish one of the major factors behind its robustness [2]. Here, we will present our recent findings of strong biaxially anisotropic optical response of van der Waals arsenic trisulphide [2] along with a novel approach of an engineering of the chiraoptical response in trilayers of these crystals assembled into a helical homostructure [3]. Unlike the chiral response arising in twisted graphene or two-dimensional transition metal dichalcogenide based moiré homo- or hetero- structures [4, 5], our approach suggests an emergence of chirality entirely established on the effect of biaxial optical anisotropy of the van der Waals crystal. It demonstrates prospects of engineering the chiraoptical response at an intermediate level between the molecular and mesoscopic one due to the tailored arrangement of initially non-chiral layers.

References

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Figures

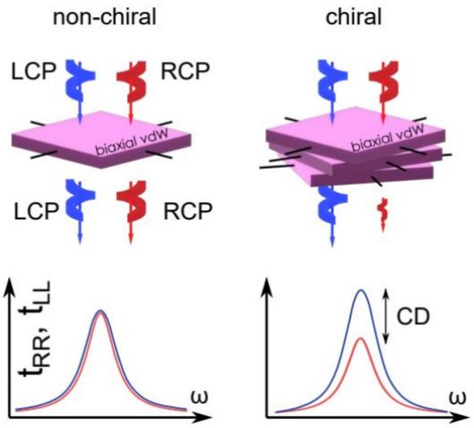

Figure 1: Engineering chirality in van der Waals homostructures comprising biaxially anisotropic arsenic trisulphide layers arranged in a helical fashion.