Optoelectronic and Tunneling Probe of Moiré Magnetism in Twisted CrI_3

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Moiré stacking in twisted two-dimensional CrI_3 has been predicted to host various non-collinear spin textures and magnetic phases arising due to competing ferromagnetic (FM) and anti-ferromagnetic (AFM) interlayer exchange interactions[1]. Recent results have shown evidence of co-existing FM and AFM interlayer interactions in small-twist angle CrI_3 bilayers and double-bilayers[2][3].

I will discuss magnetoresistance and magnetic circular dichroism of the photocurrent response from twisted double-bilayer CrI_3 vertical tunnel junction devices(Fig. 1). Our results reveal new hysteric and anisotropic field evolution, which are modeled using detailed micromagnetic simulations. Notably, we identify two distinct non-volatile spin textures at ~1° twist angle, each exhibiting different global tunneling resistance that can be switched by an applied magnetic field. This opens the possibility of control and electrical detection of moiré magnetic textures.

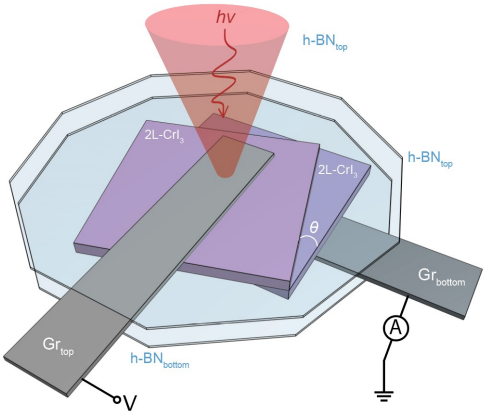

Fig. 1. Vertical tunnelling device geometry for probing magnetoresistance and photocurrent response from twisted CrI_3

References

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