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IAPME Seminar

Intrinsic skyrmions in monolayer Janus magnets

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Skyrmions are localized solitonic spin textures with protected topology, which are promising as information carriers in ultra-dense and energy-efficient logic and memory devices. Recently, magnetic skyrmions have been observed in magnetic thin films, and are stabilized by the extrinsic interfacial Dzyaloshinskii-Moriya interaction (DMI) and/or external magnetic fields. We investigate the intrinsic magnetic skyrmions in a family of monolayer Janus van der Waals magnets, MnSTe, MnSeTe, VSeTe, and MnSSe, by the first-principles calculations combined with the micromagnetic simulations. The monolayer Janus MnSTe, MnSeTe, and VSeTe with out-of-plane geometric asymmetry and strong spin-orbit coupling (SOC) have a large intrinsic DMI, which could stabilize a sub-50 nm intrinsic skyrmions in monolayer MnSTe and MnSeTe at zero magnetic field. While monolayer VSeTe with in-plane easy axis forms magnetic domain rather than skyrmions. Moreover, the size and shape of skyrmions can be tuned by an external magnetic field. Therefore, our work motivates a new vista for seeking intrinsic skyrmions in atomic-scale magnets.

Introduction of speaker

Dr. Jiaren Yuan received his Ph.D. in physics from Nanjing University of Aeronautics and Astronautics (NUAA); China, in 2019. After working as a lecturer at Jiangsu University for three years, he joined Nanchang University in 2022. Dr. Yuan's current research focuses on the theoretical description of magnetic properties of 2D materials, as well as the transport properties of 2D materials. He has published over 30 papers in peer-refereed journals, including 1 PNAS, 1 AFM, 1 Nano energy, 3 PRB. These papers receive total citations over 950 and an H-index of 13. He has been invited to write book/chapter about 2D TMDC materials by wiley Press.

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