



Department of Materials Science and Engineering Seminar Series 2024

2D Magnetism and Their Heterostructures

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Abstract

The variety of two-dimensional (2D) materials is increasing day by day, expanding the range of phenomena that can be investigated in both two and three dimensions, as well as the types of van der Waals (vdW) heterostructures that can be created for different applications. Then, the discovery of 2D magnetic materials sparked a lot of interest in vdW and magnetism communities. As we go to the 2D limit, samples start exhibiting quite different features from the bulk features, and the magnetic properties of such materials depend sensitively on a structure and external factors, such as number of layers, stacking order, electrical and magnetic fields, strain, etc. Current work is dedicated to the research of fundamental properties of 2D van der Waals magnetic systems as well as to their further applications. In some vdW materials, such as chromium trihalides, different stacking induces a change from ferromagnetic to antiferromagnetic coupling, influencing micro- and macro-magnetic properties, leading to coexistence of multiple magnetic domain subsystems in the bulk in the intermediate thickness range. When a field cooling procedure is performed, it is possible to induce topological spin textures in the system. Eventually, it was used as a barrier in tunnelling devices, where it was possible to control and manipulate magnetic domains and skyrmionic bubbles with the tunnelling current.

Biography

Sergey Grebenchuk obtained his Bachelor's degree in Applied Physics and Mathematics from Moscow Institute of Physics and Technology (MIPT) in 2017 and a Master's degree from MIPT and Skolkovo Institute of Science and Technology as part of a joint degree program in 2019, where he studied coexistence of superconductivity and ferromagnetism in iron pnictides and electronic properties of systems of long Josephson junctions. He is currently a PhD candidate in the Department of MSE under the supervision of Prof. Konstantin S. Novoselov. His research is dedicated to 2D magnetic van der Waals materials, their heterostructures, and control of their properties.

Please join us!

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