

van der Waals layered magnetic semiconductors

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Ferromagnetism in van der Waals two-dimensional (2D) materials has been reported recently. Intrinsic CrI₃ and CrGeTe₃ semiconductors reveal ferromagnetism but the T_c is still low below 60K. In contrast, monolayer VSe₂ is ferromagnetic metal with T_c above room temperature but incapable of controlling its switching via gating due to metallic nature. Moreover, the long-range ferromagnetic order in diluted metal chalcogenide semiconductors has not been demonstrated at room temperature. The key research target is to realize the long-range order ferromagnetism, T_c over room temperature, and semiconductor with gate tunability. In this talk, we introduce magnetic dopant, vanadium in semiconducting WSe₂ and manifest T_c at room temperature and gate tunability at low doping concentration. We further explore different doping concentrations including highly degenerate regime and demonstrate unconventional magnetic order by random telegraph spin noises via interlayer coupling and strange metal.

References

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