Huge doping and unconventional superconductivity in NbSe2 misfit compounds

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Abstract

In the current quest of innovative materials which combine two-dimensionality, strong spin-orbit, valley physics, superconductivity, charge density wave, quantum-spin Hall effect, the transition metal dichalcogenides (TMD) misfit materials appear as extremely promising. They are constituted by sandwiching rocksalt layers, such as LaSe, and TMD layers such as NbSe2. A very large combination of materials is achievable by playing on the stacking. We will show that TMD misfits are a new platform that allows achieving unprecedented high doping levels in TMD materials (1). Superconductivity in these compounds exhibits a huge in-plane critical field which is much higher than the paramagnetic limit (2) due to a very strong Ising spin-orbit coupling. We will show some hint of non-conventional pairing in misfit compounds.
1) Misfit Layer Compounds: A Platform for Heavily Doped 2D Transition Metal Dichalcogenides, Raphaël T. Leriche et al., Advanced Functional Materials 31, 2007706 (2021)
2) Extreme in-plane upper critical magnetic fields of heavily doped quasi-two-dimensional transition metal dichalcogenides, P. Samuely et al., Phys. Rev. B 104, 224507 (2021)

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