

New opportunities of engineering excitonic phases in 2D materials

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Exciton insulator (EI), a conductor for excitons but an insulator for charges, emerges in a material when its charge gap becomes smaller than the exciton binding energy. An exciton gas spontaneously forms and could host plenty exotic phases—Bosonic Superfluid, Exciton Solid, Chiral Pseudospin Liquid, etc. In this report, I will demonstrate a strongly correlated EI ground state formed in transition metal dichalcogenide (TMD) semiconductor double layers. Such kind of equilibrium excitonic system provides new opportunities for engineering quantum many-boson states in solids.