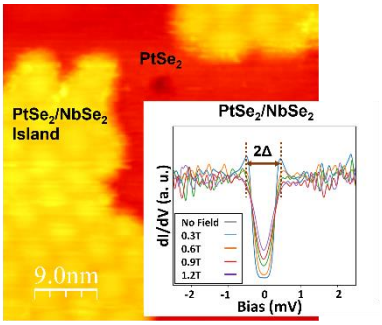
Spatially Long-Range Proximity-Induced Superconductivity in $PtSe_2/NbSe_2$

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H-phase $NbSe_2$ is a model superconductor within the transition metal dichalcogenide (TMD) family of layered materials. Notably, superconductivity in $NbSe_2$ persists down to the monolayer limit [1]. This robustness makes it an excellent platform for investigating induced superconducting proximity effects for future nanomaterial-based hybrid devices. Here, we probe these proximity physics by scanning tunneling microscopy and spectroscopy (STM/S) at 60 mK on single-layer $PtSe_2$ grown over monolayer $NbSe_2$ on a graphene/SiC substrate. $PtSe_2$ exhibits strong interlayer coupling, undergoing a semiconductor to semimetal transition within just three layers [2]. Surprisingly, spectroscopies on single layer $PtSe_2/NbSe_2$ hybrids reveal metallic characteristics and a superconducting gap of a magnitude comparable to that of pristine monolayer $NbSe_2$. Upon applying an out-of-plane magnetic field, the superconducting gap systematically decreases, reflecting the field-induced suppression typical of 2D superconductors. Topographic imaging reveals a hexagonal Moiré pattern on the heterostructure islands and a weak charge density wave. These observations demonstrate that strong interlayer coupling can effectively transplant superconductivity into a monolayer semiconductor, offering valuable insights for tailoring novel quantum phases in TMD heterostructures.



REFERENCES

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