The Abdus Salam International Centre for Theoretical Physics

Conference on Frontiers of Nanoscience
24 August - 1 September 2015, Trieste, Italy

Exotic Superconductivity and Magnetism in Transition Metal Dichalcogenides

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Abstract:

In conventional ferromagnet/superconducting heterostructures the (equal spin) triplet components of superconducting pairing can be induced by virtue of non-collinear magnetization, presence of Rashba spin-orbit interaction, or spin active interfaces. Here, we investigate the proximity effect at monolayer MoS2 or other transition metal dichalcogenides, at the presence of unidirectional exchange splitting inside it and show that one can induce triplet pairing inside it without spatial variations of the exchange field. The presence of intrinsic spin orbit interaction in this material leads to the spin split valence subbands having opposite directions at the two valleys and aligned perpendicular to the plane of MoS2. Then imposing an external spin splitting in the x − y directions inside the 2D plane, the spin alignment of electrons in two valleys becomes non-collinear to each other. Subsequently the superconducting correlations between electrons from two valleys (time reversal partners) can find a triplet component as well.