Controlled Superconductivity in Van der Waals Superconductor/Ferromagnet Heterostructures

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It is a well-known fact that in thin-film hybrid superconductor/ferromagnet (S/F) structures the exchange field induced in the superconductor suppresses superconductivity [1]. This effective field appears as a result of the proximity effect with the ferromagnet. Quasi-2D and van der Waals S/F heterostructures provide a convenient platform for realizing phenomena associated with proximity effects, because in this case the interface region extends over the entire material. Due to the low number of monoatomic layers in the heterostructure, the effects of hybridization of electronic spectra turn out to be important in the described heterostructures, due to which the superconducting state will be greatly modified. The degree of hybridization, and hence superconductivity, can be controlled using the gate voltage, which is of great scientific interest. In this talk we discuss the modification of the superconducting state in quasi-2D and van der Waals S/F heterostructures. In addition, we report how the behavior of the superconducting state depends on a change in the number of monolayers: from non-trivial behavior in the monolayer regime to behavior that almost corresponds to the conventional bulk case.

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References

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