

Quantum magnetism and topological superconductivity in Yu-Shiba-Rusinov chains

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Chains of magnetic adatoms on superconductors have been discussed as promising systems for realizing Majorana end states. Here, we show that dilute Yu-Shiba-Rusinov (YSR) chains are also a versatile platform for quantum magnetism and correlated electron dynamics, with widely adjustable spin values and couplings. Focusing on subgap excitations, we derive an extended t-J model for dilute quantum YSR chains and use it to study the phase diagram as well as tunneling spectra. We explore the implications of quantum magnetism for the formation of a topological superconducting phase, contrasting it to existing models assuming classical spin textures.