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Interfaces of Molecular Magnets and Superconductors

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Hybrid systems combining superconductors (SCs) with magnetic atoms or molecules have revealed a rich landscape of emergent phenomena, including the formation of localized electronic states at their interfaces, with promising implications for spintronics [1]. In contrast to atomic impurities, magnetic molecules offer chemical tunability, enabling tailored coupling strengths between molecular spins and superconductors [2]. In this contribution, we present results from low-energy muon spin rotation (LE-μSR) experiments on hybrid interfaces comprising molecular magnetic materials (MMMs) deposited on superconducting Nb and Pb thin films. We find that MMMs such as $TbPc_2$ and CuPc significantly perturb the superconducting state near the interface, as evidenced by modified magnetic field profiles in the Meissner state. These results provide key insight into the nature and spatial extent of magnetic proximity effects in molecular spin–superconductor heterostructures.

[1] Linder J. et al., Nat. Phys., 2015, 11, 307-315.
[2] Hatter, N., et al. Nat Commun., 2015, 6 8988.

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