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Non-Reciprocal Transport in Molecular Intercalated 2D Superconductors

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We report the realization of an organic-molecule-intercalated two-dimensional superconducting superlattice that exhibits a superconducting diode effect (SDE) under zero magnetic field [1, 2]. Unlike conventional superconductor/ferromagnet heterostructures, this system shows an anomalous enhancement of superconductivity and a zero-field SDE. The polarity of the effect can be tuned by controlling the magnetization direction of the intercalated organic molecules, suggesting a coupling between magnetism and superconductivity. Supporting evidence is provided by the observation of the Kondo effect and an anomalous Hall effect [3]. These findings establish a new material platform and theoretical basis for developing high-efficiency, zero-field, low-power superconducting electronic devices.

References:

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