Spin and charge control of topological end states in exchange biased chiral graphene nanoribbons

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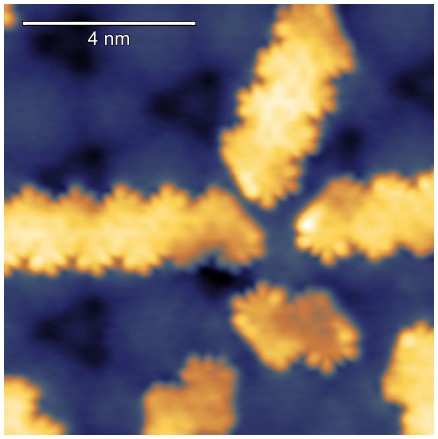

Nanographene can exhibit radical states due to sublattice imbalance or nontrivial topological phases. On-surface synthesis (OSS) enables growth of such structures with atomic precision, whose electronic structure and magnetism can then be probed by scanning tunnelling spectroscopy. The magnetism of the topological end states in chiral graphene nanoribbons (chGNRs) however remains unobserved, as electron transfer of two electrons to or from the substrate readily occurs for small mismatches in electron affinity, quenching magnetism [1].
When alloyed with rare-earth metals [2], gold still catalyses OSS, while exhibiting a much lower work function [3]. We show here that defect-free (3,2,8)-chGNRs can be synthesized on the ferromagnetic $GdAu_2$ intermetallic surface, and do not undergo charge transfer. We furthermore observe that the occupancy of the two topological end states, as well as their total spin multiplicity, can be switched reversibly from a doublet to a singlet, and then to a triplet configuration by lateral manipulation. The prominent spin-flip excitation is interpreted as a Kondo-screened π-radical state acted upon by the highly site-dependent [4] exchange bias.

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