Two-dimensional metalorganic ferromagnets

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Driven by applications in information technology, the search for new materials with stable, long-range magnetic ordering continues. Metalorganic magnets, involving the coordination of metal atoms with specific organic ligands, are a focus of intense research. These magnets offer customizable properties through synthetic adjustments to ligands or coordination chemistry. Here the synthesis, structural characterization, and magnetic properties of the 2D cyanocarbon magnet NiTCNE is reported. 2D-crystalline domains of this single-layered metalorganic network reach sizes exceeding 30 nanometers through co-deposition of the ligand TCNE (tetracyanoethylene) and Ni atoms on an Au(111) surface under ultrahigh vacuum conditions. Non-contact atomic force microscopy visualizes the structure with atomic resolution. X-ray magnetic circular dichroism establishes the 2D NiTCNE as a ferromagnet, with a very high magnetic remanence, a coercive field of around 1 tesla and a Curie temperature between 10 and 20 Kelvin. As metalorganic chemistry opens a large variety of routes of synthesis, we anticipate that this materials research paves the way to new magnetic nanomaterials for spintronics applications.[1]

References

[1] E. I. Neziri et al., 'Two-dimensional metalorganic ferromagnets', Aug. 29, 2024, arXiv: arXiv:2408.16369. doi: 10.48550/arXiv.2408.16369

Figures

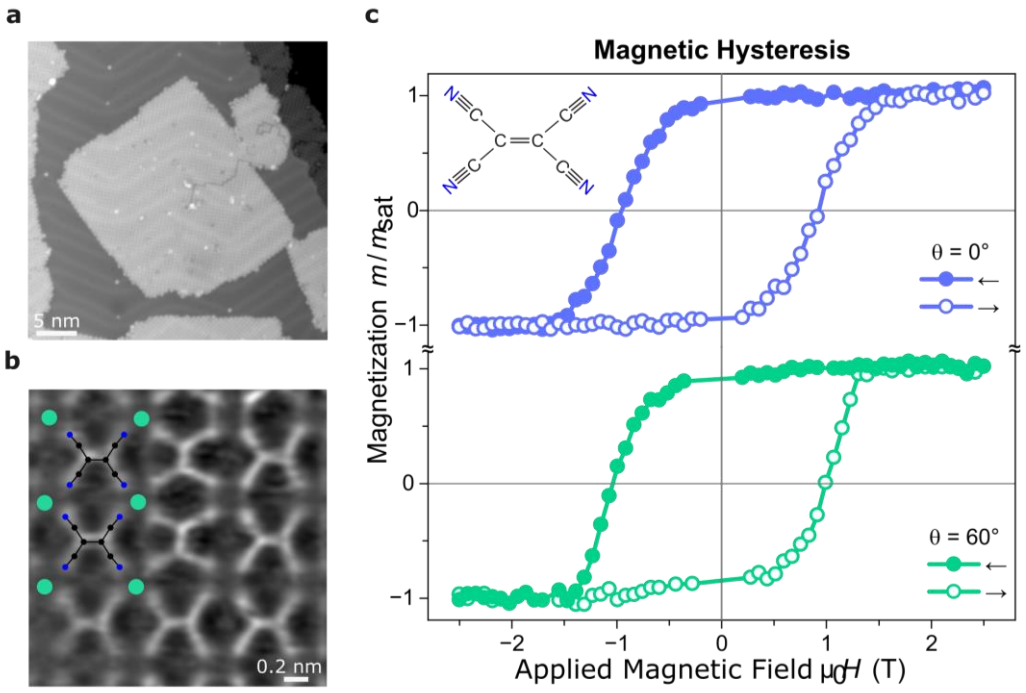

Figure 1: (a), (b) SPM data of 2D NiTCNE on Au(111). (c) XMCD magnetization curves revealing magnetic hysteresis.