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Atomic-scale spin textures in model-type systems studied with spin-polarized STM

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Non-collinear magnetic order arises due to competition of different magnetic interactions. Often the dominant interaction is the exchange between neighboring atomic magnetic moments. An additional sizable exchange interaction to more distant magnetic moments, or a contribution from anisotropic exchange (DMI), typically lead to spin spiral ground states in the absence of magnetic fields. However, also metastable zero-field skyrmions in a ferromagnetic surrounding can arise, as found for the system of Rh/Co/Ir(111) [1].
In contrast, higher-order interactions can give rise to two-dimensionally modulated magnetic states on the atomic scale that are the ground states even at zero magnetic field [2]. Different examples of such atomic-scale non-collinear magnetic order will be presented, namely the row-wise antiferromagnet and the triple-Q state in Mn monolayers on Re(0001) [3], and the uniaxial and hexagonal magnetic states found in Fe/Rh/Ir(111) (Fig. 1), and the driving forces will be discussed.

References

[1] S. Meyer, …, KvB et al., *Nature Commun.* **10**, 3823 (2019).
[2] S. Heinze, KvB et al., *Nature Phys.* **7**, 713 (2011).
[3] S. Spethmann, …, KvB et al., *Phys. Rev. Lett.*, **124**, 227203 (2020).

Figures

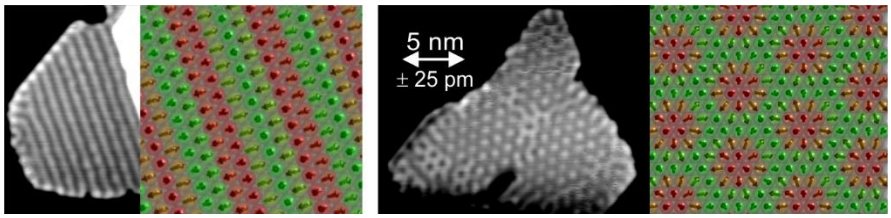

Fig. 1: STM constant-current images of two different Fe monolayer stackings on a Rh monolayer on Ir(111) and sketches of possible spin textures, in which each arrow represents an atomic magnetic moments colorized to show the out-of-plane magnetization component.

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