Probing the Spin Spiral in Fe Chains on Ir(001) using Magnetic Exchange Force Microscopy

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The collective motion of spin textures in atomic-scale one-dimensional systems enables information transmission with low current at the nanoscale [1,2]. While reading such spin textures with current-free methods is essential for miniaturized spin-based schemes, directly probing them without relying on electrical techniques remains a major challenge [3-6]. Here, we use magnetic exchange force microscopy to probe the spin texture in one-dimensional Fe chains on Ir(001) [7]. The experiments were conducted at 4.5 K under external magnetic fields. We found that ferromagnetic coupling with the tip apex magnetic atoms enables the readout of the spin texture in the Fe chain. Our ability to locally detect spins in a one-dimensional structure may pave the way for studying spin information as it propagates between the input and output of miniaturized spin logic devices.

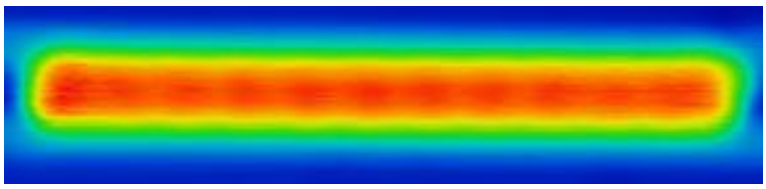

Figure 1. Spin-polarized STM image of a bi-atomic Fe chain, which forms on a (5 × 1) -reconstructed Ir (001) surface. Imaging condition: Constant current mode. V = 600 mV, I = 3.0 nA, T = 4.5 K and B_{ext} = + 3.0 T. The chain exhibits a modulation along its axis with the periodicity of three atomic distances of Fe atoms.

Reference

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