Real-space imaging of phase domains in FeRh by PEEM

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Equiatomic FeRh has attracted considerable interest due to its first-order phase transition from an antiferromagnetic (AF) state to a ferromagnetic (FM) state at 360 K in bulk. This unusual behavior is relevant both fundamentally [1] and for potential technological applications [2,3]. During the transition, FeRh shows AF-FM phase coexistence, which can be directly visualized microscopically due to the strong coupling of magnetic, structural, and electronic properties. Here, we introduce a photoemission electron microscopy (PEEM) approach for imaging AF–FM phase coexistence in FeRh thin films based on phase-dependent changes in photoelectron yield. This provides direct imaging of AF and FM regions with spatial resolution down to $\sim$ 10 nm exceeding typical spatial resolution of x-ray PEEM [4] and complements the established UHV microscopy methods. Importantly, the method relies only on a standard Hg UV lamp, making it broadly accessible for *in situ* studies of FeRh phase-transition dynamics. A representative PEEM image is shown in the Figure below.

References:

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[3] J.-U. Thiele and [illegible] Mart, Applied Physics Letters **82** (2003), p. 2859–2861
[4] C. Baldasseroni and C. Bordel, Journal of Physics: Condensed Matter **27** (2015), 256001

This work

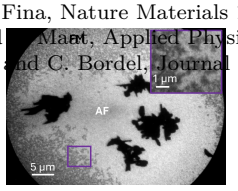

Figure: PEEM image of FeRh thin film at phase coexistence. It features AF regions (light gray), FM regions (dark gray), and defects (black). Inset: marked area close-up.

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