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Imaging Magnetic Order and Frustration on Distinct Sublattices in Artificial Quasicrystals[1] BARRY FARMER, Department of Physics and Astronomy, University of Kentucky, ANDREW BALK, Center for Nanoscale Science and Technology, National Institute of Standards and Technology. Maryland Nanocenter, University of Maryland, VINAYAKA BHAT, Technical University of Munich, ERIC TEIPEL, NATHAN SMITH, Department of Physics and Astronomy, University of Kentucky, JOHN UNGURIS, Center for Nanoscale Science and Technology, National Institute of Standards and Technology, JEFFREY TODD HASTINGS, Department of Electrical and Computer Engineering, University of Kentucky, LANCE DE LONG, Department of Physics and Astronomy, University of Kentucky
— Scanning electron microscopy with polarization analysis (SEMPA) was used to acquire direct images of as-grown magnetization textures for Permalloy thin films patterned into Penrose P2 tilings (P2T). Simulations yield a low-energy manifold of textures composed of two distinct, perfectly ordered sublattices and two sublattices that remain frustrated. As-grown P2T samples exhibited large domains of the two ordered sublattices in the room-temperature SEMPA images. Higher resolution Monte Carlo simulations based on long-range dipolar interactions predict the two frustrated sublattices will order. These results indicate 3$^{\text{rd}}$ generation P2T will offer the first example of magnetic order in a quasicrystalline material.

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