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Magnetic Properties of Single Crystal Nickel Nanowires[1] JIMMY KAN, KEITH CHAN, ERIK SHIPTON, ERIC FULLERTON, University of California - San Diego — Toward the goal of understanding magnetism in confined dimensions, we have synthesized Nickel nanowires (NWs) by chemical vapor deposition and characterized their magnetic properties. By tuning chemical vapor deposition synthesis parameters, we can controllably synthesize a variety of morphologically dissimilar Ni products onto untreated amorphous SiO2||Si substrates [1]. These structures include polycrystalline core-shell NWs, single-crystal cubes, in-plane wires, and vertically-oriented single crystal arrays. To probe the magnetic properties of individual NWs, we combined magneto-transport, XPEEM, and magnetic modeling. For polycrystalline NWs, the magnetic properties are dominated by shape anisotropy. However, for single-crystal NWs, there is a competition between the shape anisotropy along the (001) direction and magneto-crystalline anisotropy along the (111) direction. This gives rise to complex magnetic stripe domain patterns along the wires, interesting magneto-transport properties, and novel reversal modes not typically observed in magnetic wires.

[1] K.T. Chan, J.J. Kan, E.E. Fullerton, et al., "Oriented Growth of Single-Crystal Ni Nanowires onto Amorphous SiO2," Nano Letters, Oct. 2010

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