

Artificial magnets designed from nanoparticles using hard and soft crystalline assembly.

(Mentor: Sayantani Ghosh; co-mentors: Jason Hein, Linda Hirst) This project will involve developing magnetic superlattices from nanoparticles (NPs) assembled using organic frameworks that will include both hard and soft crystalline materials. The final goal will be to fabricate and study interesting magnetic phases that will arise from novel spatial arrangements of the magnetic NPs, and to be able to manipulate the assembly using external controls, such as electric and optical fields. The research will be divided into two phases. The first phase will involve the assembly, where the goal will be to use pre-synthesized flexible and rigid organic molecules to coat the NPs, thus allowing them to either self-assemble into multi-scale networks, or direct their assembly into superlattices using “click-chemistry”, both using established protocols. The second phase will involve using magneto-optical imaging using the Kerr effect to study the magnetic properties of the assembly.