

Effect of Dipolar Magnetostatic Interaction on Magnetic Remanence & Susceptibility

Bruce Moskowitz (PI), Michael Jackson, Yifan Hu, Amy Chen

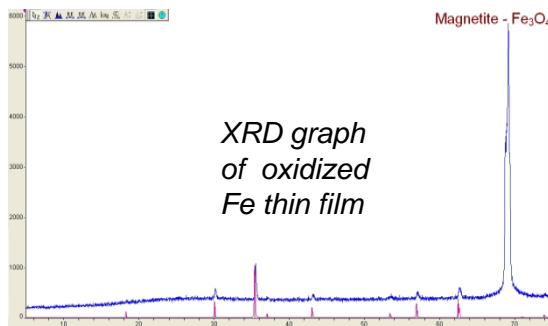
Institute For Rock Magnetism, Geology & Geophysics, University of Minnesota

NNIN Facility utilized: Nanofabrication Center

- **Goal & method:** To investigate the effect of dipolar magnetostatic interaction on magnetic remanence & susceptibility. We use e-beam lithography (EBL) to fabricate controlled size and interparticle spacing Fe_3O_4 particle arrays.
- **Work in progress:** We are testing EBL parameters and lift-off procedures suitable for mass-production of Fe_3O_4 particles. We are also trying to find appropriate thermal treatments for converting Fe films to stoichiometric Fe_3O_4 .

- **Results:** We have established plausible EBL parameters as well as lift-off procedures. Diffraction angle from XRD confirmed the presence of Fe_3O_4 as the product of thermal treatment of Fe. SQUID magnetometry revealed a phase transition (Verwey transition $\sim 120\text{K}$) unique to Fe_3O_4 , confirming successful conversion from Fe to Fe_3O_4 . We have also identified the Fe_3O_4 Curie temperature from the thermal treatment product.

SEM image of EBL
dose calibration trial
sample



Normalized SIRM displaying Verwey transition

