

DEPOSITION OF NANOMAGNETIC NICKEL FERRITE FILMS, Nkiruka Okeke, Danny Xiao*, and Santosh K. Kurinec, Department of Microelectronic Engineering, Rochester Institute of Technology, *Inframat Corporation, nao5987@rit.edu, dxiao@inframat.com, skkmc@rit.edu

Nanocompositing has opened a new opportunity to develop novel high frequency soft magnetic materials for miniaturization of magnetic components. In conventional micrometer sized magnetic materials, each particle possesses many magnetic domains which cause interference or resonance. Domain wall resonance restricts the frequency characteristics of the initial permeability. When the size of the magnetic particle is smaller than the critical size for multidomain formation, the particle is in a single domain state. Domain wall resonance is avoided, and the material can work at higher frequencies. Soft magnetic nanocomposite films have been prepared by electrodeposition of nickel ferrite prepared by Inframat Corporation. Inframat's technology employs a low temperature approach based on the aqueous synthesis method has been developed to synthesize very fine NiFe_2O_4 nanoparticles. The procedures include (1) preparation of a salt solution that contains Ni and Fe with the selected atomic ratio, (2) addition of the NH_4OH solution into the Ni and Fe precursor solution to adjust pH, without any precipitation, (3) conversion of the precursor solution into a Ni-Fe-O complex powder, and (4), conversion (calcine) of the Ni-Fe-O material into nanostructured NiFe_2O_4 at low temperature in hydrogen and oxygen controlled atmosphere. The size of the ferrite nanoparticle is ~ 5 to 15 nm. The ferrite particles were suspended in isopropyl alcohol (IPA) containing traces of magnesium nitrate and lanthanum nitrate, $\text{La}(\text{NO}_3)_3$ and $\text{Mg}(\text{NO}_3)_2$ and glycerin. A DC voltage in the range of 100-200V was applied to electrodes separated by 2 cm. An aluminum anode was used while the cathode was silicon wafer with conducting aluminum film. Detailed results on film morphology and physical properties will be presented.