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**Growth and Properties of Magnetic Spinel Ferrite Thin Films and Heterostructures**[1]

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There is considerable interest in the growth of single crystal spinel ferrites films because of their numerous technological applications in areas such as microwave integrated devices, magnetoelectric coupling heterostructures, and potentially as an active barrier material in an emerging class of spintronic devices called spin filters. Unlike perovskites, the study of spinel ferrite films is quite limited in part due to the complex crystal structure with a large unit cell consisting of many interstitial sites and that the transition metal cations can adopt various oxidation states. We have grown high-quality, atomically smooth epitaxial ferrite ($NiFe_2O_4$, $CoFe_2O_4$ and $LiFe_5O_8$) films using chemical vapor deposition and pulsed laser deposition techniques and carried out detailed studies of their structural, magnetic and optical properties. Of particular interest are systematic studies on the formation of antiphase boundaries in epitaxial $NiFe_2O_4$ films grown on different substrates and the accurate determination of the band gap of this material using optical spectroscopy and first principles calculations. Additionally, we have grown ferrite films on piezoelectric substrates and observed large shifts in the ferromagnetic resonance profile due to magnetoelectric coupling resulting from electrostatic field-induced changes in the magnetic anisotropy field. Work done in collaboration with N. Z. Bao, W. H. Butler, R. Datta, B. S. Holinsworth, M. Iliev, S. Kanuri, S. V. Karthik, G. Kim, T. M. Klein, N. Li, M. Liu, P. R. LeClair, J. X. Ma, D. Mazumdar, T. Mewes, D. V. B. Murthy, J. L. Musfeldt, K. R. O'Neal, N. Pachauri, V. M. Petrov, H. Sato, S. Schäfer, L. Shen, H. Sims, G. Srinivasan, N. X. Sun, Q. -C. Sun, and Z. Zhou.

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