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Magneto-Optical Faraday Effect in NiO and NiFeO Thin Films[1]

BRIAN COLLIER, WILHELMUS GEERTS, AHAD TALUKDER, JAMES NICK TALBERT, AARON MEDINA, ANDRES OLIVA, Department of Physics, Texas State University — Recently, Resistive Random-Access Memory (RRAM) has been the focus of research due to its high bit density as a possible replacement for flash memory. The switching characteristics of RRAM give rise to curiosity of the possible use of metal oxides, such as NiO and iron doped NiO, for use in RRAM devices. In the low resistance state, large oxygen-vacancy-clusters may be magnetic and provide a low resistive path for electrons, therefore we investigated the magneto-optical properties of reactive RF-sputtered NiO and NiFeO thin films. Samples were sputtered with oxygen flow rates of 1% and 10% on fused quartz and microscopic glass slides and were characterized using the magneto-optical Faraday effect. This technique measures the rotation of polarized light in transmission mode as a function of an applied magnetic field. The high sensitivity of this method makes it ideal for characterization of the magnetic properties of thin film materials to detect possible magnetic regions in the films. The Faraday rotation was used to calculate the Verdet constant for each sample. Measurement results indicate that doping of Fe as well as sputtering at a low (1%) oxygen flow rate correlate with a higher Verdet constant.

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