Title: Study of magnetic phase transitions by impedance spectroscopy
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Because of the growing interest of high performance magnetic sensors and memories in information science and technology, there is a strong demand for the characterization of novel magnetic materials. For example, epitaxial intermetallic thin films and multilayers, such as multilayers based on FePtRh and FePdRh, as fantastic candidates for magnetic sensors and transducers, and CrO_2 thin films have attracted attention for magnetic memories. Rapid characterization of these materials is the focus of this project. Different compositions of FePtRh and FePdRh show the first order phase transition from antiferromagnetic to ferromagnetic or paramagnetic by manipulating the temperature and applied magnetic field due to the scattering of itinerant electrons through the s-d exchange interactions with magnetic moments. CrO_2 has a Curie temperature of ~400K. These phase transitions yield to dramatic change of impedance of these materials. Using impedance spectroscopy (IS) we can achieve the comprehensive knowledge of the behavior of these materials, through their frequency-dependent impedance during the phase transition, providing key input for future device considerations.