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Electron-Spin Resonance of Chromium-Doped Vanadium Dioxide PATRICK BUNTON, D. BLANE BAKER, KENNETH MAYNES, KENNETH HARTMAN, William Jewell College, ANDREJ HALABICA, RENE LOPEZ, RICHARD HAGLUND, Vanderbilt University — We have investigated the metal insulator transition (MIT) in vanadium dioxide using the electron-spin resonance (ESR) response of a chromium probe. Our goal is to elucidate information regarding potential trigger mechanisms for the MIT such as extrinsic defects or thermal excursion associated with soft modes. A chromium-doped vanadium dioxide film was prepared on fused-silica by pulsed laser deposition in oxygen followed by annealing in an oxygen atmosphere. The chromium dopant proved to be sensitive to the MIT, exhibiting a hysteretic dependence of chromium intensity. A 140 nm-thick film exhibits a factor of four decrease in chromium line intensity as the temperature increases across the MIT. ESR can yield information regarding thermal excursions of lattice ions as well as symmetry information – typically through either linewidth or axial spin Hamiltonian parameter. In addition, decreases in ESR signal intensities are discussed in relation to changes in electron spin-lattice relaxation times. Extensions to two-dimensional films of contiguous nanoparticles and to nanoparticle arrays will be discussed.

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