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Infrared Reflectivity of Metal Transition Granular Films N.E. MASSA, F.P. DE LA CRUZ, LANAIS en Espectroscopía Optica-CEQUINOR, U.N.L.P., C. C. 962, (1900) La Plata, Argentina, J. DENARDIN, L. SOCOLOSKY, M. KNOBEL, Instituto de Física, UNICAMP, 13083-970, Campinas-SP, Brazil, X. X. ZHANG, Institute of Nanoscience and Tecnology, Hong Kong, University of Science and Technology, Hong Kong, China — We present infrared reflectivity of 550 nm granular films made of transition metals embedded in a SiO_2 amorphous matrix. $TM_x(SO_2)_{1-x}$(TM=Fe, Ni, Co),($0.25 \leq x \leq 0.85$) display giant magnetoresistance and giant Hall effect slightly above the percolation threshold.Our samples yield spectra typical of conducting oxides where carrier localization, depending on concentration, is triggered by the nanoparticles roughness and SiO_2. They have a distinct Drude component raising in intensity as the concentration and/or size of TM nanocrystallites increases Thus, while granular films of Fe and Ni, $x \sim 0.85$, above the percolation threshold, have a reflectivity with a tail extending beyond 0.8 eV, characteristic of carrier hopping conductivity (small polaron localization), reducing the size and amount of the transition metal crystallites, as for $x \sim 0.35$, the spectra have mid-infrared bands known for a localized polaron scenario with a very strong longitudinal optical-electron interaction. Our results support a model involving transition metal d-orbitals hybridizing oxygen p orbitals, yielding, as the crystallites get closer, the crossover between semiconducting and metal-like behavior within the context of a mixed phase environment.

N.E. Massa
LANAIS en Espectroscopía Optica-CEQUINOR, U.N.L.P.

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