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Surface Plasmons in Synergy with the Spin Crossover Phenomena at the Nanometric Scale

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Extended Abstract

A number of pseudo-octahedral 3d4-3d7 transition metal complexes have been reported to display a molecular bistability of their high-spin (HS) and low-spin (LS) electron configurations, which can be reversibly interconverted under external stimuli, such as temperature, pressure, magnetic field, or light irradiation. This spin crossover (SCO) phenomenon is accompanied by a spectacular change of magnetic, optical, dielectric, and mechanical properties.[1]

In the past years, the SCO field has found a strong renewed interest mainly inspired by the emergence of nanosized SCO materials such as coordination nanoparticles and nano-patterned thin films2. The lowest size limit at which these cooperative effects are maintained turns into one of the key fundamental questions in this field. Beside the intriguing size-related properties, synthesizing thin films and other nanoscale assemblies of SCO complexes also represents a key step toward their technological applications in photonic and electronic devices[2].

Conventional macroscopic techniques as magnetic susceptibility and heat capacity measurements, X-ray diffraction, and Mossbauer, vibrational, and electronic spectroscopies has become very limited for the investigation of SCO at the nanometer scale, and the development of new experimental approaches becomes indispensible.

In this presentation, we describe different approaches for the elaboration of thin films of SCO materials and we show that the use of the surface plasmon resonance (SPR, see figure below) spectroscopy can be a very powerful tool to detect the variation on the refractive index that accompanies the SCO phenomenon at the nanometric scale.[3-4]

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