Probe of the Spin-Switching in Spin-Crossover Materials: A Micro-Magnetometer

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The work is driven by two reasons: (*i*)Spin-crossover (SCO) materials are of interestsince they are one of the best-known forms of an inorganic electronic switching. Variation thermal energy at the crossover leads to both an electronic and structural change, often observed as a change of colour and/or a magnetic moment. A number of research have been reported concerning the synthesis of nanoscale of SCO nanoparticles [1]. The development of these new, tailored architectures is central for the exploration of the physical properties of these materials, at the mesoscopic scale the SCO is a prototype example of mixed-valence crystals and many efforts have been done to understand charge transfer process between the iron sites. Indeed, metal-to-metal electron transfer phenomena in the complexes play an important role in the intense colors of these compounds, in their electrical conductivity, in their electrochemical properties and influences also their magnetic properties. Not surprisingly, electron transfer processes are involved in nearly all practical applications of these new functional materials, such as electrochromic windows, electrocatalytic and electroanalytical devices, molecular based magnets, sensor, display, information storage and nanophotonic devices. (*ii*)Up to now, the observations are essentially reduced to the simple investigation of the temperature dependence of the magnetisation or the optical absorption in a huge ensemble of nanoparticles with different degrees of size dispersion by using high sensitivity conventional measurement systems such as superconducting quantum interface device (SQUID), or by transmission electron microscopy and/or dynamical light scattering measurements. Magnetoresistivemagnetometer[2]canovercomethesesdrawbacks. Compared to the SQUID based ultrasensitive magnetic detection systems, the magnetoresistive technology has advantages of room temperature operation, less complex instruments, and hence more portable and flexible implementation. They could be microscopic in size and sensitive to the presence of small magnetic particles when they are in close proximity. They can detect extremely weak magnetic fields, for example, the magnetic field at nano or picotesla generated by the magnetization of a single micro/nano size object. Such a magnetometer will enable and well adapt for studying the magnetic properties of a single object of SCO molecular based materials. The talk deals withoptimization of novelmagnetoresistive sensor to detect the spin-switching of SCO materials down to nano world and to understand of size-related spin-crossover properties. Several measurement methods to enhance the sensitivity of the magnetometer are also discussed. The final target to detect a single SCO particle will be done in collaboration among three groups by combining the forces from France and Korearesearchers.

참고문헌

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