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Stimuli-responsive magnetic materials based on molecules: From bulk materials to nanomaterials

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Responsive materials for which physical or chemical properties can be tuned by applying an external stimulus are attracting considerable interest in materials science. This kind of materials may be viewed as a new generation of multifunctional materials in which two (or more) functional properties are not simply co-existing in the same material but strongly coupled to guarantee its response to the external stimulus.

A source of stimuli-driven molecular materials results from the construction of hybrid solids formed by inserting a responsive molecule into a functional network. In this last case the structural or electronic changes induced in the responsive molecule by the applied stimulus can result in a change in the structure and properties of the functional network.

Here I will illustrate how this molecular approach can be used to design a new generation of smart materials in which their magnetic properties can be tuned by applying an external stimulus. As responsive molecule I will use spin-crossover complexes and photo-switchable molecules. I will show three different examples: i) Magnetic coordination polymers which can respond to a chemical stimulus (adsorption of gas molecules) (1); ii) Photo-responsive layered magnets (2) and iii) Spin-crossover nanoparticles which can be electrically driven (3).

References

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