Editorial: Molecular Magnets

Wolfgang Linert and **Michel Verdaguer**

Between magnetochemistry which was measuring magnetism of chemicals with the hope to discover their structures, to molecular magnetism which can be defined as a discipline which conceives, realizes, studies, and uses new molecular materials bearing new but predictable magnetic (and other) physical property, a few decades took place.

Instead of going to the laboratory shelves to study the magnetic properties of already existing chemicals, chemists are now designing new (supra)molecular systems to get low density, transparent, biocompatible magnets, bistability, single molecule magnet behaviour, materials whose properties can be changed by temperature, pressure or light, or still molecular objects combining several physical functions (magnetism and conductivity, magnetism and optics . . .).

This new field is blossoming in many countries, in North America, in Japan, and in Europe. Different European networks (including a Molecular Magnets programme of the European Science Foundation) were recently very active and produced major results. It is our pleasure to welcome in this volume some of the actors of this scientific saga, which is on the way to transform molecules in useful devices.

Our volume opens by a brief and lively historical overview of the domain by one of the leaders in the field, Prof. *Dante Gatteschi*, a chemist who received in 2002 with four other colleagues, chemists and physicists, the Agilent Technologies Prize of the European Physical Society: this fact alone demonstrates how the field is indeed multidisciplinary. The content of the volume is another illustration of the diversity of the scientists engaged hand in hand in molecular magnetism: quantum chemists and physicists, computing more and more accurately the properties of molecules and solids and opening astonishing prospects in the field of electronic quantum computing; chemists and physicists using large instruments (neutrons and synchrotron radiation sources) to extract unique information unavailable by other techniques and then comparing to theoretical models. Some of the synthetic chemists present here, tailor spin cross-over systems which present a fascinating bistability between two states with different magnetic properties and colours, opening the way to the use in display devices. Others assemble molecules bearing very large spins, which do not exist ‘‘naturally’’ in the elements of the periodic table; anisotropy will confer to these systems the ability to store magnetic information at the molecular level, to reach the highest, ultimate storage density of information; some transform the beautiful C60 fullerene molecule in a molecule-based magnet;

some others combine cleverly the power and the flexibilities of organic and inorganic molecular chemistry to get multifunctional materials, magnetic and conducting, magnetic and optically active .... All of them provide the physicists community with wonderful new objects to study and the engineers with new functions to be used tomorrow in useful devices.

The field is not only multidisciplinary but also more and more international: many of the contributions imply various laboratories belonging to different countries, each of them having a unique expertise which is shared when necessary. Active international cooperation is indeed at work here.

We hope that the reader will enjoy the volume as much as we enjoyed ourselves and that the book will help in developing more rapidly the exchange of ideas and experience in this exciting new scientific area, molecular magnetism.

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