

Molecular magnetism

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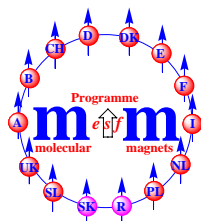
Research into molecular magnetism, began in 1951 with the study of a dinuclear complex, copper acetate [1] but it received a strong impetus in the 1980s with the discovery of the first molecular-based solids that exhibited spontaneous magnetization below their Curie temperature. The extremely important and interesting was the discovery of the single molecule magnets (SMM's) made by Gatteschi and coworkers (1989). Those systems behave as magnets without the need of interaction between neighboring molecules.

A number of important discoveries have since been made by European teams in particular in the frame of international programmes like ESF Program Molecular Magnets (1995-2002):

- the synthesis of the first bimetallic molecular magnets and organic magnets with the highest Curie temperature known so far,
- the synthesis of room-temperature molecular-based magnets,
- the discovery of spin cross-overs that occur with large hysteresis at room temperature,
- new photomagnetic processes, including light-induced excited spin-state trapping,
- the synthesis of the first molecular-based magnetic superconductor,
- the first characterisation of magnetic tunneling effect.

The main goal of the research taken in the field of molecular magnetism is to understand the fundamental principles that govern magnetic behaviour, in particular when moving from isolated molecules to three-dimensional solids. Currently molecular chemistry is focused on the study how to theoretically design and synthesise new molecular magnetic systems with specific magnetic and electronic properties. A very important aspect of investigations is also to get to know how electronic and molecular structures relate to the macroscopic physical properties.

At this moment a very intensive molecular magnetic investigations are carried out within European Commission's Six Framework Program "Molecular Approach to Nanomagnets and Multifunctional Materials" MAGMANet (Network of Excellence) 2005-2009.



[1] B. Bleaney, K.D. Bowers, Proc. Royal Soc. A **214** (1952) 451.

[2] European Science Foundation Programme « Molecular Magnets » (MM), IREG Strasbourg, October (1999)

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