

Molecular Magnets: New Perspectives for Synchrotron Radiation

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Molecular magnets are relatively new born in the family of magnetic materials. However they are attracting increasing interest, because they give rise to many new properties which are difficult to be observed in classic magnets based on metallic or ionic lattices. The area of molecular magnetism is a strongly interdisciplinary one, where very efficient collaborations have been established between chemists and physicists, the former designing new classes of molecular materials, the latter measuring the properties and developing theoretical models.

At the beginning the synthetic effort was concentrated on the goal of obtaining purely organic magnets and of reaching critical temperatures above room temperature. More recently chiral magnets have become the focus of attention, together with the design of materials showing the coexistence of conducting or superconducting behaviour and magnetic properties.

The results of the above efforts have been rather satisfactory, but recently it has been observed that large, but finite, magnetic molecules which can be considered as zero dimensional magnetic materials may be perfect testing ground for theories treating quantum effects in mesoscopic magnets. A class of molecules characterized by a large spin value in the ground state and large Ising type magnetic anisotropy show bistability of molecular origin, thus behaving as bulk magnets. On the other hand these molecules are still small enough to show large quantum effects, like tunnelling of the magnetisation and quantum interference effects. Some of these materials have been investigated also with synchrotron radiation for observing XMCD properties.

Finally it has been discovered that slow relaxation of the magnetization, not accompanied by long range order, can be observed also in polymers. This may open exciting perspectives for storing information in magnetic nanowires.