

Hybrid materials with coexistence or switching of properties

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The search for molecular materials showing either coexistence of magnetism with (super)conductivity, or switching of the magnetic / conducting properties by means of a physical stimulus, constitutes one of the current trends in the areas of the molecular conductors, superconductors and magnets [1]. A chemical approach that has been used to reach this goal consists of building up two-network solids formed by two molecular fragments, where each network furnishes distinct physical properties. Thus, examples of paramagnetic conductors and superconductors, as well as of ferromagnetic conductors have been reported, which can be useful to illustrate this concept. Still, the search for materials exhibiting more unusual coexistence of properties (superconductivity and ferromagnetism, for example), or a switching of properties, remains a challenge. In this contribution we will present our recent efforts to obtain such a kind of multifunctional materials. The following examples will be reported: i) Layered materials with coexistence of superconductivity and ferromagnetism; ii) Molecular materials with coexistence of ferromagnetism and molecular bistability; iii) Switchable materials formed by a magnetic lattice and a molecular switch.

[1] E. Coronado and P. Day, *Chem. Rev.* 104 (2004) 5419.