

concentration of components etc., are general phenomena typical for condensed matter. Phase transitions can remarkably affect the physical properties of materials, and this behaviour is of great importance both for fundamental science and for materials applications. Establishing relationships between symmetry change at the transition, the mechanism and thermodynamics of a phase transition and the corresponding anomalous macroscopic properties of materials is an important step in understanding the microscopic nature of the effects, and in further developing the rational design of materials with desired properties. We will consider examples of structural phase transitions in materials particularly interesting due to their perspective properties: elevated hydrogen storage capacity, anomalous negative thermal expansion etc. The related structural features will be analyzed in the framework of a symmetry-based phenomenological theory. It will be shown how the formalism and methods of the theory of phase transitions can be applied to explaining anomalous effects even beyond the transformation region.

**Keywords:** phase transition; symmetry; transformation mechanism

#### KN-7

**New MOF Materials: Structure-Properties Considerations.** M. Angeles Monge. *Instituto de Ciencia de Materiales Madrid CSIC Cantoblanco Madrid, Spain.*

E-mail: [amonge@icmm.csic.es](mailto:amonge@icmm.csic.es)

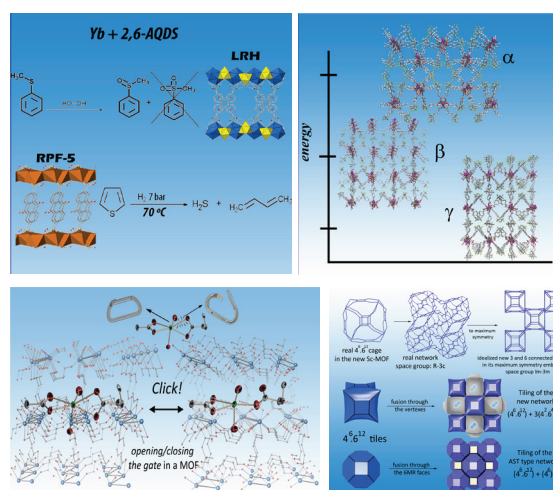
The use of rare earth elements in combination with different ligands has allowed the obtaining of several framework types, whose structural characterization, including the net topology, together with evaluation of their properties will be presented. An overview of the obtained results, on the base of structure-properties relationships allows to extract some conclusions on the properties and features of the new materials. Examples of this research will be presented:

- **Controlling the Structure of Rare Earth Arenedisulfonates towards Catalytically Active Materials.** All rare earth – anthraquinone-2,6-disulfonate materials show catalytic activity in the oxidation of methyl phenyl sulfide. Among all them, those belonging to the **LRH** family, with a 2D structure with cationic inorganic layers, are very active and selective catalysts in sulfides oxidation. Those belonging to the **RPF** families are also good catalysts for the hydrodesulphurization of thiophene. Structural features explain the differences in the activity among the materials. (Fig 1 up left).

- **Polymorphism in Rare Earth MOFs** Three Lanthanum MOF polymorphs have been obtained, their networks own unusual topologies, the three being uninodal penta-coordinated, two of them unknown up to now and the other named as **h<sub>xg</sub>-d-5-Imma**. They will be described and compared. DFT calculations of the relative energies for the three polymorphs show that the most often obtained structure is a metastable phase, which appears next to others thermodynamically more stable. Optical properties will be commented. (Fig 1 up right).

- **Reversible breaking and forming of metal-ligand coordination bonds.** A temperature triggered single-crystal-to-single-crystal phase transformation in a Metal–Organic Framework, makes this material an interesting heterogeneous catalyst. (Fig 1 down left).

- **A new Scandium Metal Organic Framework built up from Octadecasil zeolitic cages as heterogeneous catalyst.** Zeolitic cages of the AST type are found in the novel scandium-squarate MOF, and the joining of them gives rise to a new binodal network with a unique topology. This new material is an efficient heterogeneous Lewis acid catalyst (Fig 1 down right).



#### KN-8

**Complementarity of Magnetic Neutron and X-ray Scattering.** Thomas Brueckel. *Forschungszentrum Juelich GmbH / Institut fuer Festkoerperforschung / Juelich-Germany.*

E-mail: [t.brueckel@fz-juelich.de](mailto:t.brueckel@fz-juelich.de)

While the phenomena of magnetism is known to mankind since nearly 3 millennia, research on this macroscopic quantum phenomena is very topical as witnessed by the Nobel Prize in physics in the year 2007 awarded to Albert Fert and Peter Grünberg for their groundbreaking work in thin films magnetism. Understanding the magnetism of nanostructures paves the way to possible applications in information technology. Spintronics labels information storage, information transport and information processing using the spin of the electron and not its charge. In complex highly correlated electron systems, such as transition metal oxides, magnetism competes with other degrees of freedom leading to novel ground states and a high sensitivity to external disturbances and thus possible novel functionalities. In the quest to control functionalities in these complex materials and materials systems, it is essential to relate them with microscopic information on magnetic structures, magnetisation densities, magnetic excitations and fluctuations, which is a realm of scattering methods, namely neutron scattering complemented by magnetic synchrotron X-ray scattering.