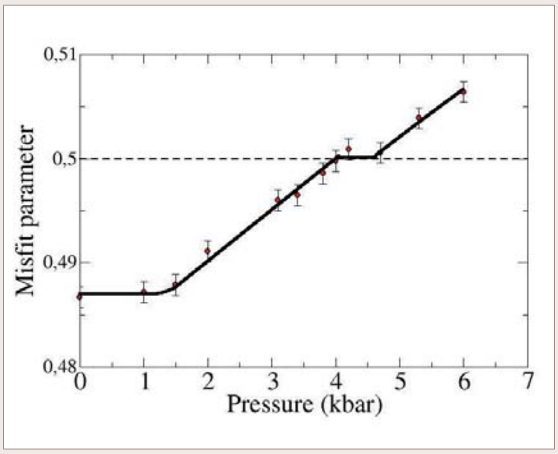
[*C1.* B. Toudic] First evidence of a pressure induced lock-in in an aperiodic composite crystal

Nanometer-sized containers have huge potential for use in molecular manipulation and chemical reactions. In the frame of this work, we report the first pressure-induced lock-in in an aperiodic nanoporous crystal [1]. This result is based on the concept of free sliding applied to aperiodic materials, allowing striking nanotribologic properties. The studied compound, urea-alkane, is a self-assembled nanoporous crystal made of a host urea lattice with hydrogen bonds and a confined guest sublattice non-covalently bounded, like in many biophysical model systems. Neutron diffraction measurements performed on a triple axis spectrometer with cold neutron, 4F, give a unique opportunity to get very high spatial resolution with the precise hydrostatic environment to very carefully measure the different lattice parameters. The retained urea-hexadecane has the period of the guest just slightly larger than twice the one of the host.



Colosal Magneto resistance (CMR) compounds

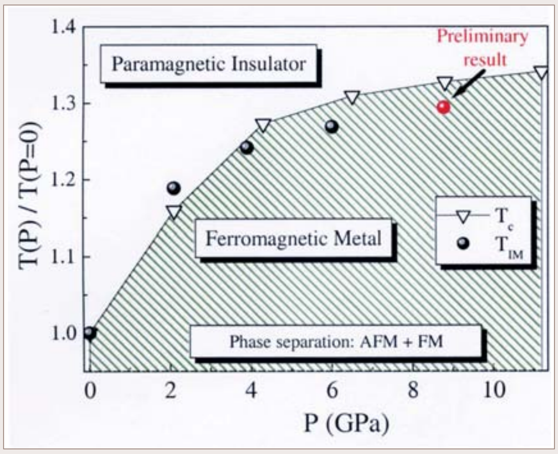
Selective compressibility allowed a commensurate lock-in at the value . Then, the two sub-systems are 'attached' as in normal crystals giving a direct proof of a lock-in energy term in such self-assembled supramolecular crystals. The continuous control of the guest repeat gives a unique tool for tuning one-dimensional properties of confined compounds. These results open a broad field of scientific subjects that can be tackled combining the low friction of incommensurate nanoporous materials with the conformational, optic and electronic properties of guest molecules.

[1] B. Toudic, F. Aubert, C. Ecolivet, P. Bourges and T. Breczewski Physical Review Letters **96**, 145503 (2006)

[Collaboration: B. Toudic, F. Aubert, C. Ecolivet, GMCM Rennes 1; P. Bourges, LLB; T. Breczewski, Bilbao]

[*C2.* M. Baldini] Pressure effects in $La_{0.75}Ca_{0.25}MnO_3$ studied by neutron and optical methods

CMR compounds exhibit a close relation between magnetic and electronic properties [1]. Optical studies revealed a rapid increase of temperature of insulator-metal transition in the prototypical CMR manganite $La_{0.75}Ca_{0.25}MnO_3$. In order to establish the relation between the insulator-metal transition and the magnetic ordering, we studied the magnetic structure of $La_{0.75}Ca_{0.25}MnO_3$ by neutron diffraction. We obtained the magnetic phase diagram and the $T_C(P)$ line over a wide pressure range (0-8 GPa). The $T_C(P)$ and the $T_{IM}(P)$ [2] behaviour under hydrostatic pressure is the same up to (at least) 8 GPa. This result provides the important evidence that the Double Exchange mechanism, responsible for the close connection between magnetic and electronic transition, still holds in the high pressure regime. On the other hand, an antiferromagnetic peak was observed at pressure above 4 GPa and T 100 K, revealing the onset of a phase separation between FM and AFM. This result gives an unambiguous answer to the hypothesis of a reinforced role of the SE coupling between the t_{2g} core spins and explains the $T_C(P)$ and the $T_{IM}(P)$ saturation observed at higher pressure [3].



[1] A.J. Millis, *Nature* **392**, (1998)

[2] A. Congeduti, P. Postorino, E. Caramagno, M. Nardone, A. Kumar, D. D. Sarma, *Phys. Rev. Lett.* **86**, 1251 (2001)

[3] A Sacchetti, P Postorino and M. Capone, *New J. of Phys.* **8**, 3 (2006)

[Collaboration: M. Baldini, E.Arcangeletti, P. Postorino, Universita di Perugia Italy, L. Capogna CNR-OGG Grenoble, I. Goncharenko, LLB.]

Magnetic pressure-temperature phase diagram of $La_{0.75}Ca_{0.25}MnO_3$