s6.m1.o3 Structural transitions related to magnetic phenomena under high pressure. G.Kh. Rozenberg, M.P. Pasternak, *School of Physics and Astronomy, Tel Aviv University, Ramat Aviv, 69978 Tel Aviv, Israel*.
Keywords: extreme conditions.

In recent years *3d* transition metal (TM) compounds (*Mott Insulators*) have been the focus of intensive basic research in materials science. Notable cases are studies of high-T_C superconductivity in doped rare-earth copper-oxides and of unusual magneto-resistance effects in doped manganese TM-oxides. A remarkable experimental observation pertinent to the nature of those strongly correlated systems has been the unambiguous discovery of the elusive Mott transition induced by pressure[1]. The Mott transition comprises an insulator-metal (IM) transition concurrent with the collapse of TM ion magnetic moments. It can be accompanied by a slight volume reduction due to electron delocalization.

Another important mechanism related to magnetism at high-pressure is the degradation and even complete collapse of the magnetic state due to *spin-crossover*: a high-spin (HS) to low-spin (LS) transition, a result of Hund's rule breakdown at very high density[2]. Such a transition will be accompanied by a significant reduction of the TM ionic radii therefore volume decrease or even structural changes.

In the above-mentioned cases the electronic transition prompts structural alterations, but *visa versa*, it is also possible that a structural phase transition will induce a *Mott* or HS-LS transition.

In this paper we discuss both type of pressure-induced transformations: *i*) structural changes resulting from magnetic/electronic phase transitions, and *ii*) magnetic/electronic changes resulting from crystallographic phase transitions. Using diamond anvil cells the following experimental tools are used: (a) **Synchrotron X-ray diffraction** for probing crystallographic phase transitions and detailed structural changes at the vicinity of the *Mott* and or HS-LS transitions, (b) **Mössbauer spectroscopy** as atomic-scale structural and magnetic probe, and (c) **electrical resistivity** as a tool to identify gapped or gapless states and features of the IM transition. As examples cases we present recent and previous results in Fe_2O_3, FeI_2, $FeCl_2$, and the $R$$FeO_3$ orthoferrites.

[1] Pasternak M. P., Taylor R. D., Chen A., Meade C., Falicov L. M., Giesekus A., Jeanloz R., and Yu P. Y. « Pressure-induced metallization and the collapse of the magnetic state in the antiferromagnetic insulator NiI_2. », Phys. Rev. Lett., (1990), **65**: 790-793.

[2] Pasternak M.P., Taylor R.D., Jeanloz R., Li X., Nguyen J.H., McCammon C.A., «High pressure collapse of magnetism in $Fe_{0.94}O$: Mössbauer spectroscopy beyond 100 GPa.», Phys. Rev. Lett., (1997), **79**: 5046-5049.

s6.m1.o4 Low temperature structural studies of molecular crystals under pressure. X-ray diffraction equipment for (P+T) phase diagram investigations. Y. Barrans, J. Gaultier, D. Le Pevelen, P. Guionneau, D. Chasseau, *Institut de Chimie de la Matière Condensée de Bordeaux, CNRS UPR 9048, 87 Av. Dr A. Schweitzer, 33608 Pessac Cedex, France.*
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The coupling of our high pressure and our low temperature techniques has been performed and tested on organic conductors: we can now reach any point of the phase diagram. We use a classical monochromatized X-ray source (CuKα for films, MoKα for intensity collection), a diamond anvil cell (pressure) fixed on a vertical closed cycle He cryostat (low temperature) and isolated with a pair of containers. The X-ray beams cross essentially Be walls in a 35° half aperture cone. A radial collimator suppresses nearly all the scattering from the containers on the patterns, and a careful screening of the background and peaks is performed for the collected intensities. Using normal beam geometry the Gaultier vertical Weissenberg camera gives informations on the reciprocal space and the Gaultier Huber three circle diffractometer allows full data collection. The possibilities of both systems will be illustrated through examples of investigations down to 7 K and up to 14 kbar.