



EINLADUNG zum IFP-SEMINAR

Emerging materials under pressure

Maria Baldini

Geophysical Laboratory, Carnegie Institution of Washington, Advanced Photon Source, Argonne National Laboratory, Argonne, Illinois 60439 USA

Host: Andrei Pimenov
Termin: Mittwoch, 26. Juli 2017, 16:00 Uhr
Ort: Institut für Festkörperphysik, TU Wien
Wiedner Hauptstraße 8-10, 1040 Wien
Seminarraum DC rot 07 (roter Bereich, 7. OG)

Abstract:

Emerging materials exhibit exotic phenomena, such as novel magnetic and electronic phases, insulator to metal transition, high-temperature superconductivity, and colossal magneto-resistance that are promising for energy applications. However, understanding and controlling these effects remain a challenge because of the comparable energy scales exhibited by microscopic interactions.

High pressures and temperatures have tremendous potential for manipulating matter to synthesize, investigate and discover the next-generation materials with optimal properties for energy applications. For example, extreme environments are capable of producing materials with unprecedented mechanical, thermal, and electronic properties [1].

In this talk I will give a general overview of the capabilities of high pressure science, focusing most on strongly correlated materials and implications for magnetism. I will present a specific case focusing on colossal magneto-resistant material: LaMnO₃ [2, 3]. We found that pressure induces the formation of a mixed phase which consists of two components: an insulating one and a metallic one. The volume fraction of the metallic phase grows with pressure and the colossal magnetoresistance effect is observed just below the percolation threshold. The experimental results are well reproduced by theoretical calculations. This result clarifies the main mechanisms behind the onset of colossal magnetoresistance [3].

1. X. Li, M. Baldini, E. Xu, T. Wang, V.t H. Crespi, B. Chen, S. Elatresh, R. Hoffman, J. J. Moliason, C. A. Tulk, M. Guthrie, J. V. Badding, "sp³ Carbon Nanothread Crystals" in preparation.
2. M. Baldini, V. V. Struzhkin, A. F. Goncharov, P. Postorino, W. L. Mao, "Persistence of Jahn Teller distortion up to the insulator to metal transition in LaMnO₃", Phys. Rev. Lett. 106, 066402 (2011).
3. M. Baldini, T. Muramatsu, M. Sherafati, H-K. Mao, L. Malavasi, P. Postorino, S. Satpathy, and V. V. Struzhkin "Origin of colossal magneto-resistance in LaMnO₃ manganite", Proc. Natl. Acad. Sci. 112 (35) 10869-10872 (2015).