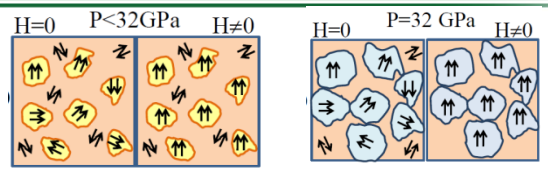
Origin of Colossal Magneto-Resistance (CMR) in manganite

Scientific Achievement

First realization of CMR in pure single-valent material.

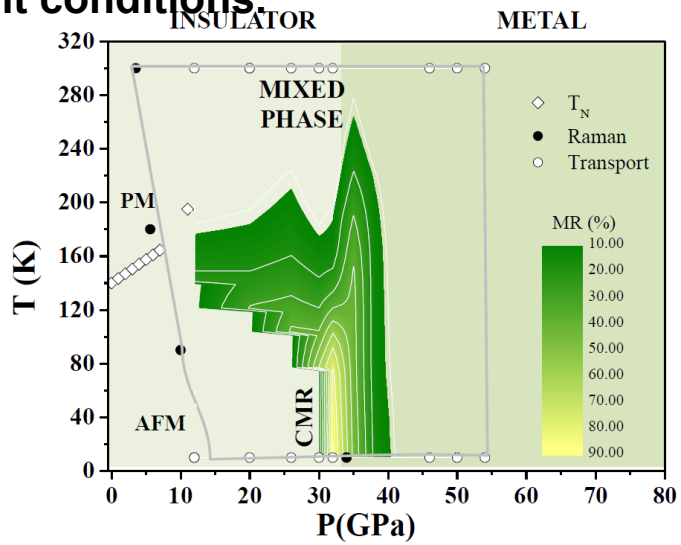


Significance and Impact

Magnetoresistance is the change of resistance in the presence of an external magnetic field. In rare-earth manganite compounds, this change is orders of magnitude stronger than any other material. This may lead to new spintronic devices with increased data density and reduced power requirements. Phase separation was identified as the crucial ingredient for CMR. Shaping the system inhomogeneity could represent an effective route for the engineering of materials displaying CMR at ambient conditions.

Research Details

- Pressure generates a mixed phase constituted by two components: a non-conductive one with a unique structural distortion and a metallic one without distortion.
- Magneto-transport data were collected at several pressure during warming and cooling cycles.
- The data are well described using percolation theory, confirming the percolative nature of the IMT and the presence of a mixed phase.



T vs. P phase diagram of LMO. The gray line marks the area in which domains are present. The color map delimits the P –T region in which MR is observed going from 15% variation (green) to 90% variation (yellow)

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 $LaMnO_3$ manganite", PNAS, August 13, 2015, doi:10.1073/pnas.1424866112

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