Institut de Minéralogie et de Physique des Milieux Condensés
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SÉMINAIRE
Mardi 16 octobre, 10h30

Salle de Conférence, 4ème étage, Tour 22-23, Salle 1
IMPMC, Université P. et M. Curie, 4, Place Jussieu, 75005 Paris

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$BaFeO_3$, A FERROMAGNETIC IRON OXIDE

A small class of oxides containing iron in a high valence state of Fe^{4+} (d^4) has been known. The most representative phase is $SrFeO_3$ (SFO) crystallizing in the cubic perovskite structure (a = 3.850 Å). SFO and related oxides behave very differently from Fe^{2+}- and Fe^{3+}-oxides like FeO, Fe_3O_4, and $LaFeO_3$ (LFO). All these Fe^{2+}- and Fe^{3+}-oxides are antiferromagnetic (or ferrimagnetic) insulators in their ground states, while the Fe^{4+}-oxides commonly exhibit a shift toward metallicity and ferromagnetism. The specificity of Fe^{4+}-oxides can be assigned to the fact that the effective charge transfer energy, Δ_{eff}, drastically drops from ~8eV for FeO and ~5.5eV for LFO to ~-3eV for SFO. The characteristics of "Fe^{4+}"-oxides should thus result from interplay of Fe d electrons and O p holes.
Very recently we succeeded in preparing $BaFeO_3$ (BFO) crystallizing in the cubic perovskite structure (a = 3.97106(1) Å). Physical characterization revealed that BFO has a spiral spin structure of the A-type below 111K but turns ferromagnetic with a large atomic moment of 3.5 μ_B/Fe on application of a small external field of ~0.3 T at 5 K (0.2 T at 77K). BFO is the very first Fe-oxide that shows ferromagnetism at ambient pressure. The magnetic transition temperature increases from 111K to more than 300K up to 40GPa.

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