**INSTITUT DE MINERALOGIE, DE PHYSIQUE DES MATERIAUX ET DE COSMOCHIMIE**

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# SÉMINAIRE
# Lundi 28 avril, 10 h 30

*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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# QUADRUPLE PEROVSKITES: A MODEL SYSTEM FOR STUDYING THE SPIN-PHONON COUPLING AND FOR MULTIFERROICS DESIGN

The Fröhlich Hamiltonian (1950), which describes the interaction of an electron with lattice vibrations, remains without either analytical or numerical solution at all coupling. This field theoretical problem is relevant to the design of multiferroic materials suitable for novel electronics devices, such as fast and low-energy-consumption non-volatile memories. Indeed, these applications require both a sizable electric polarization $P \sim 1\ \mu C\ cm^{-2}$ and a strong magnetoelectric (ME) coupling driven by a spin-phonon interaction. After a decade of intense research efforts, a number of multiferroics with strong ME couplings have been discovered, however only modest $P$ values $\sim 0.1\ \mu C\ cm^{-2}$ have been hitherto reported.

Our recent results obtained on Mn oxides with quadruple perovskite structure $AA'_3B_4O_{12}$, have unveiled unique multiferroic properties and a record P value $\sim 0.9\ \mu C\ cm^{-2}$. Our data analysis gives an account for these results in terms of the simple magnetic structure of the Mn ions and the unusually high symmetry of the sublattice of the oxygens, which limits the screening of the spin-induced polarization. We therefore show that these compounds offer a unique playground for studying the spin-phonon coupling and for tailoring the multiferroic properties of magnetic oxides by using internal strain as a very effective control parameter.

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