Influence of the pressure on the multiferroic properties of the RMn_2O_5 series

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The RMn_2O_5 series of multiferroics is extensively studied for its strong magnetoelectric coupling, which results from a quasi collinear spin order and which is understood in the exchange-striction model. Variations of the interatomic distances modified by the external pressure can strongly influence the multiferroic properties. An amazing enhancement of the electric polarization has been observed in this series under pressure. Understanding this effect is of great importance from a fundamental point of view but also for the realization of multiferroic devices. We report here X-ray and neutron powder diffraction experiments performed under pressure on two prominent compounds of the family naming, $PrMn_2O_5$ and $GdMn_2O_5$. Indeed, $PrMn_2O_5$ is not ferroelectric at ambient pressure while $GdMn_2O_5$ presents the highest electric polarization of the series. In these compounds, we have evidenced new structural and magnetic phase transitions under pressure. These results provide key information to explain the pressure enhancement of polarization in the family. Moreover, they enable us to predict that $PrMn_2O_5$ become ferroelectric thus multiferroic under pressure, resulting in the first pressure induced multiferroic material.

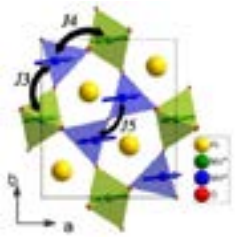

Figure 1: Magnetic structure of $PrMn_2O_5$ under pressure (8 GPa) and at low temperature (6K).

Biography

P Foury-Leylekian has completed her PhD and Post-doctoral studies from the Université Paris Sud, France. She was a Teacher at the Univeristé Paris Sud since 1996. She is currently working as a Professor at the Laboratory of Solid State Physics (LPS). She has published more than 70 papers in reputed journals.

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