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SÉMINAIRE

Lundi 14 novembre, 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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GIANT NEGATIVE THERMAL EXPANSION DRIVEN BY INTERMETALLIC CHARGE TRANSFER IN BiNiO₃

The unusual property of negative thermal expansion (NTE) is of fundamental interest and may be used to fabricate composites with controlled thermal expansion values. Systems, such as ZrW₂O₈, show NTE over a wide temperature range. NTE can result from transitions between different electronic or magnetic states coupled to the lattice, as in the case of (Mn_{0.96}Fe_{0.04})₃(Zn_{0.5}Ge_{0.5})N. BiNiO₃ is an antiferromagnetic insulator with a unique charge distribution of Bi³⁺_{0.5}Bi⁵⁺_{0.5}Ni²⁺O₃. It shows a 2.6% volume reduction under pressure due to a Bi/Ni charge transfer accompanied by an insulator to metal transition. The charge transfer transition is shifted to ambient pressure through La substitution for Bi. We found that the relative proportion of the low- and high-T phases changes as a function of temperature, thus leading to a smooth volume decrease upon heating. By means of dilatometric measurements, the linear expansion coefficient of a Bi_{0.95}La_{0.05}NiO₃ pellet was measured to be -137×10⁻⁶K⁻¹ at RT and -82×10⁻⁶K⁻¹ in the 320-380 K range.

- [1] S. Ishiwata *et al.*, J. Mater. Chem. 12, 3733 (2002).
- [2] M. Azuma *et al.*, J. Am. Chem. Soc. 129, 14433 (2007).
- [3] S. Ishiwata *et al.*, Phys. Rev. B 72, 045104 (2005).
- [4] M. Azuma *et al.*, Nature Commun. 2, 347 (2011).