SEMINAIRE DE LA MATIERE CONDENSEE

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Nesting and structural properties under pressure in the $Na_{0.5}CoO_2$ cobaltites

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Salle de conférence 15 – Bâtiment 563

The discovery of the great thermoelectric power at room temperature and the superconductivity at T~5K under hydration in the Na_xCoO_2 system [1], has attracted the attention of the condensed matter community in the last years. Additionally, the phase diagram in Na content [2] shows a rich variety of behaviors with an unexpected charge ordered insulating state for x=0.50. Previous studies of the $Na_{0.50}CoO_2$ compound showed the existence of three transitions, at 88K, 52K and 20K [2], that could be associated with three different Fermi surface (FS) nesting vectors [3]. Pressure effects studies in the resistivity of the $Na_{0.50}CoO_2$ [4] compound show that while the pressure induces a metallic behavior, the critical temperature of the charge order transition simultaneously increases. On the other hand, the transition at 88K is favored at low pressure and then decreases and completely disappears for pressure higher than 9GPa. In X-ray diffraction studies under pressure at ambient temperature in the same compounds, we show an orthorhombic to hexagonal transition at around 9GPa. This transition is associated with the Na ions displacement and the behavior of the transport properties can be associated within the mentioned nesting scenario. Low temperature X-ray diffraction studies on this compound enable us to confirm this nesting scenario.

References

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[2] M.Foo, Y.Wang, S.Watauchi, H.Zandbergen, T.He, R.Cava, N.Ong, Phys. Rev. Lett.**92**, 247001, (2004)
[3] J.Bobroff, G.Lang, H.Alloul, N.Blanchard, G.Collin, Phys. Rev. Lett. **96**, 1072001, (2006)
[4] G.Garbarino, et al, Phys. Rev. B **77**, 64105, (2008); G. Garbarino et al EuroPhys. Lett. **81**, 47005 (2008)

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