NQR study of the phase segragation and sodium ordering in cobaltates Na_xCoO_2

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We have investigated a set of sodium cobaltate samples with various sodium content ($0.67 \leq x \leq 0.75$) using Nuclear Quadrupole Resonance (NQR) [1]. The four different stable phases and an intermediate one have been recognized. The NQR spectra of ^{59}Co allowed us to differentiate clearly the pure phase samples which could be easily distinguished from multi-phase ones.

Systematic study of the $Na_{2/3}CoO_2$ compound using ^{23}Na and ^{59}Co NQR and NMR [2,3], allowed us to establish reliably the atomic order of the Na layers and their stacking between the CoO_2 slabs. We give evidence that the Na^+ order stabilizes non magnetic Co^{3+} ions on 25% of the cobalt sites arranged in a triangular sublattice. The transferred holes are delocalized on the 75% complementary cobalt sites which unexpectedly display a planar cobalt kagomé structure. These experimental results prove that both Curie-Weiss magnetism and metallic conductivity are provided by this kagomé sublattice of cobalt in sodium cobaltates.

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[1] T.A. Platova, *et al.*, JETP Lett., **91** (2010) 457

[2] H. Alloul, *et al.*, EPL **85** (2009) 47006

[3] T.A. Platova, *et al.*, Phys. Rev. B **80** (2009) 224106