Magnetic Properties of $NdBaCo_2O_{5.5}$

A. Jarry[1,2], H. Luetkens[1], K. Conder[3], E. Pomjakushina[3,4] and W. Paulus[2]

[1]*Laboratory for Muon-Spin Spectroscopy, Paul Scherrer Institut, CH-5232 Villigen PSI, Switzerland*
[2]*University of Rennes 1, Sciences Chimiques de Rennes UMR 6226, Inorganic Materials, Soft Chemistry and Reactivity, Campus de Beaulieu Bt 10B, Rennes cedex 35042, France*
[3]*Laboratory for Development and Methods, Paul Scherrer Institut, CH-5232 Villigen, Switzerland*
[4]*Laboratory for Neutron Scattering, Paul Scherrer Institut & ETH Zürich, CH-5232 Villigen, Switzerland*

Recently layered cobaltites are being studied intensively due to their rich variety of interesting magnetic and transport properties. Thus some exhibit a spin, orbital and charge order, giant magneto resistance (GMR), metal-insulator (MIT) and a manifold of magnetic (PM→FM→AFM1→AFM2) transitions as well as a high thermopower (S). Here, we present DC magnetization ZF and LF SR investigations on oxygen deficient layered double perovskites $NdBaCo_2O_{5.5}$, crystallizing in 122 type structure. The layered cobaltite $RBaCo_2O_{5.5}$ is unique among strongly electron correlated systems, since it displays ordered electronic structures and unconventional transport phenomena without extrinsic doping and having all Co ions in the trivalent state. Even though the transition temperatures are similar as for $RBaCo_2O_{5.5}$ with R = Y, Ho, Dy and Tb, the Nd compound is exceptional in many senses. In particular striking differences in the magnetic properties will be highlighted: on the one hand an independence of the observed μSR frequencies has been found indicating that only a small set of up to four different spin state order (SSO) structures are realized in the antiferromagnetic (AFM) phase separated samples $RBaCo_2O_{5.5}$ with R $\neq$ Nd. On the other hand the measured frequencies for $NdBaCo_2O_{5.5}$ are different either due to different SSO in the AFM phase or due to different interstitial lattice site occupied by muons. Unusual dynamic properties in the ferromagnetic phase have also been observed.