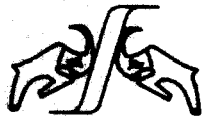
Institute of Physics, Adam Mickiewicz University
Institute of Molecular Physics, Polish Academy of Sciences

The European Conference

PHYSICS OF MAGNETISM 99



June 21-25, 1999
Poznań, POLAND

ABSTRACTS

Ośrodek Wydawnictw Naukowych • Poznań 1999

P.3.24

MAGNETISM AND ELECTRONIC STRUCTURE OF $LaCoO_3$

Z. Ropka[a], R. Michalski[a,b] and R.J. Radwański[a,b]
[a]Center for Solid State Physics, św. Filip 5, 31-150 Kraków
[b]Inst. of Physics, Pedagogical University, 30-084 Kraków, Poland.

$LaCoO_3$ exhibits unusual magnetic properties intriguing the magnetic society by more than 30 years, after pioneering works of Goodenough (*Phys.Rev.* **155** (1967) 932). $LaCoO_3$ show a diamagnetic low-temperature state that seems to transform with temperature into a magnetic state. It is often discussed in terms of low-spin and high-spin states. Recently an intemediate-spin state has been additionally postulated to exist (*Phys.Rev.* B **54** (1996) 5309).
We have performed calculations of the fine electronic structure of the Co^{3+} ion in the perovskite-like structure of $LaCoO_3$. We have found that the diamagnetic state of $LaCoO_3$ is related with the non-magnetic state of the Co^{3+} ion in the atomic scale. Moreover, we have found microscopic picture for the existence of the low-, intermediate- and high-spin states of the cobalt ions and their transformation with temperature. Very strong correlation between the local magnetism, the local crystallographic symmetry (Jahn-Teller effect) and the fine electronic structure has been found.
The present results confirm the importance of the spin-orbit interactions on the 3d-ion moment and can enlighten mechanisms responsible for the formation of 3d magnetic moments.

P.3.25

RELAXATION OF ^{53}Cr SPIN ECHO SIGNALS IN $Cd_{0.985}Ag_{0.015}Cr_2Se_4$

G.N. Abelyashev, V.N. Berzhansky, S.N. Polulyakh, N.A. Sergeev*
Simferopol University, 333036 Simferopol, Ukraine
*Szczecin University, 70-451 Szczecin, Poland

The frequency dependencies of relaxation times of NMR spin echo signals of quadrupole nuclei ^{53}Cr at t=2τ and t=4τ were measured in ferromagnetic semiconductor $Cd_{0.985}Ag_{0.015}Cr_2Se_4$ at the temperature T=4.2K. It was shown that in cadmium selenochromite there are two kinds of quadrupole nuclei Cr (Cr(I) and Cr(II)), which have quite different relaxation times. The existence of two kinds of Cr nuclei was connected with doping of cadmium selenochromite with Ag^+ ions. The nuclei ^{53}Cr(II) are sited in crystal ranges where rapid electron exchange between Cr^{4+} and Cr^{3+} ions leads to the rapid fluctuations in local electron magnetization vector. The nuclei ^{53}Cr(I) are located far from these dynamical defects. The experimental results were well explained by the developed theory of the two-pulse echoes relaxation. The main assumption of this theory is the assumption that the time fluctuations in the electron magnetization due to the fluctuations in hyperfine and quadrupole nuclear Hamiltonians leads to the relaxation of the spin echo signals.