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Inhomogeneity of charge and spin distribution in CuO₂ layers of high-T_c superconductors: NQR/NMR studies of 1-2-3 compounds

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Abstract

The copper NQR and ZFNMR and thulium NMR are studied in a series of 123 superconductors. It is found that in the aged 60-K superconductors RBa₂Cu₃O_{6+x} the well known conducting (nonmagnetic) phase co-exists with the magnetically-ordered phase. Both microphases contain two types of inequivalent Cu(2) sites in CuO₂ planes. In the conducting phase, these sites differ only in the Cu(2) NQR frequency, whereas in the magnetic one they differ also in the value of hyperfine magnetic fields at Cu(2) nuclei. These differences and the occupation numbers of the two sites are found to be independent of x (in the range $x = 0.5 - 0.6$) and of the volume fraction of the magnetic phase. At low temperatures, the nuclear spin-lattice relaxation in both microphases proceeds via magnetic centers formed by hole-doped Cu-O-Cu chain fragments. © 1999 Plenum Publishing Corporation.

Keywords

Chain fragments, CuO₂ layers, NQR, Spin-lattice relaxation, ZFNMR