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Intrinsic paramagnetic centers in 1-2-3 superconductors

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Abstract

The ^{169}Tm "enhanced" NMR in $\text{TmBa}_2\text{Cu}_3\text{O}_{6+x}$ ($x=0.5, 0.6$) at temperatures below 4.2K and the $^{63}\text{Cu}(1)$ NQR in $\text{YBa}_2\text{Cu}_3\text{O}_{6.5}$ at temperatures above 4.2K are used to study properties of intrinsic paramagnetic centers incorporated into superconducting materials. The spin-lattice relaxation of thulium and copper nuclei reveals three types of paramagnetic centers to be present in oxygen-deficient 1-2-3 superconductors, those are (1) two-level ones with a spin $S=1/2$, localized outside CuO_2 bilayers, (2) singlet-ground-state paramagnetic centers with an integer spin $S \geq 1$ in CuO_2 bilayers, and (3) exchange copper-oxygen clusters with a half-integer spin $S \geq 5/2$, localized in a nearest neighborhood of CuO_x basal plane at boundaries of superconducting Ortholl microdomains. © 1995 Plenum Publishing Corporation.

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Keywords

1-2-3 superconductors, NMR, NQR, paramagnetic centers, spin-lattice relaxation