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EPR study of polycrystalline superconductors with YBa2Cu3O7 structure

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Abstract

Electron paramagnetic resonance (EPR) of Gd3+, Eu2+, and copper ions has been investigated in the high-Tc superconductor with YBa2Cu3O7-α structure. It has been established that the system is heterogeneous at 0.15≤δ≤0.5 and consists of metallic and dielectric regions. The former arises due to oxygen enrichment while the later due to oxygen deficiency. The integral of exchange interaction between Gd3+ localized moments and conduction electrons Jsf=0.016 eV has been determined from the normal state temperature dependence of Gd3+ EPR linewidth for metallic regions. Tc depression by gadolinium-localized moments for GdBa2Cu3O7-α was estimated to be ΔTc{reversed tilde equals}-2K. Anomalies in linewidth temperature dependence upon transition from the normal to the superconducting state have given information about the value and temperature behavior of the superconductor's energy gap. The model, which gives the opportunity to understand some peculiarities of the EPR signal for YBa2Cu3O7-α samples, is proposed in terms of several bottlenecked spinsubsystems: spin-liquid in CuO planes and Cu2+-O- and Cu2+-O2- fragments in CuO chains. © 1989 Plenum Publishing Corporation.

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