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Intrinsic magnetic centers and microdomains in oxygen-deficient YBa2Cu3O6.5 and TmBa2Cu3O6+x

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Abstract

We measured the influence of magnetic centers (MC's) on the nuclear relaxation in 123 compounds using 169Tm NMR and 63Cu NQR in TmBa2Cu3O6+x (x = 0, 0.2, 0.3, 0.4, 0.5, 0.6), and 89Y NMR and 63Cu NQR in YBa2Cu3O65. Particular attention is paid to the region 0.5≤x≤0.6 in order to deal with both a well-defined ortho II structure and a high enough MC concentration. The experiments reveal a two-component nuclear relaxation in the superconducting compounds at temperatures above 1 K, especially pronounced in the x = 0.5 samples. The relaxation data give evidence for microphase separation due to oxygen disorder in the basal CuOx planes. In the well-annealed samples, the MC's predominating the relaxation have S= 1/2. The concentrations of these MC's are of the order of 3% in the disordered (nonsuperconducting) microphase and ~0.3% in the ordered (superconducting) one.