

Stability and thermal expansion coefficient of high-temperature superconductors $RBa_2Cu_3O_y$

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Abstract

Using thermogravimetry, mass-spectrometry and magnetometry chemical stability of high-temperature superconductors $RBa_2Cu_3O_{6+\delta}$ with $R = Y, Nd$ in relation to moisture was studied. To increase the rate of degradation the mechanical activation of powders in a ball mill was used. It is found that the weakening of the diamagnetic signal corresponding to the superconducting phase may be due to both their chemical degradation and suppression of superconductivity by magnetism of unexplored nature. Such magnetism manifests itself in samples containing magnetic R -ion. With the help of X-ray powder diffraction the temperature dependences of unit cell parameters were obtained and linear thermal expansion coefficients were calculated for compounds with $R = (Y, Ca), Eu (Nd, Eu)$. The last composition has a positive and almost constant coefficient of thermal expansion in the temperature range 80–300 K, that makes it perspective for use in superconducting films and composites.