SUBSTITUTIONS Ba^{2+}/Ln^{3+} IN $GdLn_XBa_{2-X}Cu_3O_{7\pm Z}$ (Ln-La, Pr, Nd, Sm, Eu, Gd) $0 \leq X \leq 0,6$ SYSTEMS

$GdLn_xBa_{2-x}Cu_3O_{7\pm\delta}$ (Ln = La, $0 \leq x \leq 0.6$; Ln = Pr, Nd, Sm, Eu, Gd, $0 \leq x \leq 0.5$) samples were synthesized using the sol-gel method. The starting materials were rare-earth metal oxides, barium carbonate dissolved in acetic acid, and copper(II) acetate. For all the starting substances the degree of purity was not less than "chemically pure". The contents of rare-earth element and copper cations were determined by direct trilonometric titration, the Ba^{2+} content by gravimetry. An ammonium citrate solution served as gel-forming substance. The resulting mixture was evaporated until the formation of a gel, which was then decomposed by gradually heating up to 800°C. The ceramics obtained this way were ground and calcined in air at 820–840°C for 72 hours. After this they were once again ground and pressed into pellets of 10 mm diameter and 1–2 mm thickness. The pellets were sintered for 4 hours at 900°C, then kept for 24 hours at 450°C in oxygen atmosphere, and finally slowly cooled to room temperature in a flow of oxygen.

The homogeneity region, variation of the crystal lattice and oxygen nonstoichiometry of the $GdLn_xBa_{2-x}Cu_3O_{7\pm\delta}$ (Ln = La, Pr, Nd, Sm, Eu, Gd) solid solutions were studied as a function of the substitution degree x. It was shown that the homogeneity region becomes wider when going from Gd^{3+} ($x \leq 0.3$) to La^{3+} ($x \leq 0.5$), but for all lanthanides the symmetry changes from orthorhombic to tetragonal for $x \sim 0.05$. Thus, the homogeneity region becomes wider when going from Gd^{3+} to La^{3+}. This fact may be explained by the increase of the ionic radii of the rare-earth cations in the same sequence. Measurements of the electrical resistance of $GdLn_xBa_{2-x}Cu_3O_{7\pm\delta}$ samples in the temperature range 77–300 K revealed superconducting transition temperatures over 77 K only for $x = 0$ and $x = 0.05$.

Key words: high temperature superconductors, rare-earth elements, sol-gel synthesis