

EFFECTS OF RE-DOPING ON SUPERCONDUCTING PROPERTIES AND THE CORRELATION WITH THE EXTERNAL HYDROSTATIC PRESSURE IN N=3 MERCURY PHASE (Hg,Re-1223).

Marcos T. D. Orlando, Alfredo G. Cunha

UFES

Elisa Baggio-Saitovitch, Wilson Vanoni, Humberto Belich

CBPF/CNPq

Evandro V. L. Mello

UFF

Luis Gallego Martinez

IPEN/USP

Jacyra Sorares

IAG/USP

Maria Regina C. Caputo

UFMG

Agusti Sin, Xavier Obradors

ICMAB - Barcelona- Espanha

Samples of the $Hg_{1-x}Re_xBa_2Ca_2Cu_3O_{8+x}$ superconductor (Hg,Re-1223), with varying rhenium (Re) content ($0.00 < x < 0.30$) were produced with the help of a novel thermobaric analysis (TBA) which can monitor the total pressure inside the quartz tube during the synthesis at high temperatures. The sample quality was verified by means of Rietveld analysis of the X-ray diffraction data, AC susceptibility, and by AC resistance measurements. The same procedure was used to prepare all the samples with different Re content (reduction of oxygen content in the precursor $Re_xBa_2Ca_2Cu_3O_{7+X}$ and the increase of the mercury partial pressure inside the quartz tube). The Re atoms lead to a reduction of the lattice parameter along the c-axis with a decrease of the lattice volume which is equivalent to an applied hydrostatic pressure of 1 GPa. The aim of this work is a comparative and quantitative study of the chemical and external hydrostatic pressure on the Hg,Re-1223 system. The samples with $0.10 < x < 0.25$ showed strong magnetic shielding effects and low residual resistance. Resistance measurements as a function of temperature display an increase of the superconducting transition temperature T_c with applied hydrostatic pressure. The dT_c/dP value depends strongly on the Re doping and the sample with the Re content $x = 0.18$ showed the largest measured $dT_c/dP = 6.8(2) \text{ K GPa}^{-1}$. We argue that the Re concentration does not increase T_c in the same way as external hydrostatic pressure but provides a strong influence on the intrinsic term proposed by Almasan et al [Phys. Rev. Lett. 69 (1992) 680].
