

Evaluation of precursor on the Hg,Re-1223 polycrystalline samples

Jos L. Passamai Jr, Carlos A. C. Passos, Paulo C. M da Cruz, Marcos T. D. Orlando, Cintia G. Pinheiro
High Pressure Laboratory - PresLab, CCE - Universidade Federal do Espírito Santo - ES, Brasil

H. P. S. Correa

Departamento de Física, Universidade Federal do Mato Grosso do Sul, Brazil

L. G. Martinez

Instituto de Pesquisas Energéticas e Nucleares - IPEN, Campus USP, São Paulo - SP, 05508-900, Brazil.

Samples of $Hg_{0.82}Re_{0.18}Ba_2Ca_2Cu_3O_{8+d}$ were prepared by solid-vapour reaction technique. Firstly, preparation of the ceramic precursor typical began with a mixture of $Ba_2Ca_2Cu_3O_x$ and ReO_2 in powder form with the molar relationship 1 : 0.18. It is known that the oxygen stoichiometry may be modified and controlled through the thermal treatment. Then, the obtained precursor material was then submitted to an annealing with three different partial pressure of oxygen: 5% of O_2 and 95% of Ar (sample A), 10% of O_2 and 90% of Ar (sample B) and 15% of O_2 and 85% of Ar (sample C). X-ray powder diffraction pattern (XRD) analysis of each precursor preparation step was done in order to evaluate the oxygen content of the ceramic precursor. The identified phases were $BaCuO_{2+x}$, $Ba_2Cu_3O_{5+x}$, $Ba_4CaCu_3O_{8+x}$, Ca_2CuO_3 and $Ca_5Re_2O_{12}$. The $BaCuO_{2+x}$ phase was found 64%, 33% and 50% from the XRD spectra for sample A, B and C, respectively. The $Ba_2Cu_3O_{5+x}$ phase was found 10%, 34% and 14% for sample A, B and C, respectively. While the $Ca_5Re_2O_{12}$ phase was found 5%, 7% and 10% for sample A, B and C, respectively. On the other hand, the peaks associated with the $BaCuO_{2+x}$, $Ba_2Cu_3O_{5+x}$ phases, which has oxygen stoichiometry variation, are slightly displaced to low angles. This is an indication that there was a oxygen increment of the precursors ceramics B and C, as compared with ceramic A. Finally, the precursors prepared with different O_2 partial pressure were blended with HgO at molar relationship 1 : 0.82. XRD measurements indicated that the main phase was Hg,Re-1223 (93% Wt %), residues of $HgCaO_2$, $BaCO_3$, $CaCuO_2$ and $BaCuO_2$ were also found. The phase Hg,Re-1223 was very crystalline as shown by the small broadening of their peaks. The XRD spectra of all samples were quite similar and the cell parameters did not show important differences. These samples were also investigated by ac electrical resistivity measurements. Our results showed similar T_c (133.6, 133.9 and 133.7 K for sample A, B and C, respectively).