Hg,Re-1223 system : TC dependence on hydrostatic pressure and thermopower measurements

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After the discovery of high temperature superconductivity (HTS), the highest T_c of 134 K (ambient pressure) was recorded in the new family of mercury-based superconductors for $HgBa_2Ca_2Cu_3O_{8+d}$ compounds. The rhenium (Re) substitution at the Hg site have improved the preparation of $(Hg, Re)Ba_2Ca_{n-1}Cu_nO_y$ in a quartz tube method. The Re substitution provides a reduction of cell volume (chemical pressure), but the effect on T_c is distinct of an external hydrostatic pressure In this work, samples of $Hg_{1-x}Re_xBa_2Ca_2Cu_3O_{8+d}$ superconductor (Hg,Re-1223) were prepared with varying rhenium (Re) nominal content ($0.10 < x < 0.25$) in order to study the changes on the critical temperature under external hydrostatic pressure. At low pressures the dT_c/dP depends strongly on the Re doping and the sample with $x = 0.18$ shows the largest measured value. However, thermopower measurements reveal that there is no significant change in the numbers of carriers for the different Re content ($0.10 < x < 0.20$) meaning that dT_c/dn is the same for all samples which, in principle, have an optimal oxygen content. Taking into account that $dT_c/dP = dT_c^i/dP + [dT_c/dn][\mathrm{dn/dP}]$ and dT_c/dn does not depend on the Re content, we can argue that the intrinsic term (dT_c^i/dP) determines the influence of external hydrostatic pressure on Tc.There is no theory about the origin of the intrinsic term, despite some attempts have been made to relate it with changes in the phenomenological attractive potential of an extended Hubbard model.