SYNTHESIS OF $Y_1Ba_2Cu_3O_x$ SUPERCONDUCTING POWDERS BY INTERMEDIATE PHASE REACTION.

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One of the more striking problems for the synthesis of the $Y_1Ba_2Cu_3O_x$ compound is the high-temperature decomposition of the BaCO$_3$. This compound is present as raw material or as an intermediate compound in chemical processes such as amorphous citrate, coprecipitation oxalate, sol-gel process, acetate pyrolysis, etc. This fact dificulds the total formation reaction of the $Y_1Ba_2Cu_3O_x$ phase and leads to the presence of undesirable phases such as the BaCuO$_2$ phase, the "green phase", $Y_2BaCuO_5$ and others.

In the present work a new procedure to overcome this difficulty is estudied. The barium cation is previously combined with yttrium and/or copper to form intermediate compounds which can react between them to give $Y_1Ba_2Cu_3O_x$.

$BaY_2O_4$ and $BaCu_2O_3$ react according to the following equation

$$BaY_2O_4 + 3BaCu_2O_3 \rightarrow 2Y_1Ba_2Cu_3O_x$$

$BaY_2O_4$ is a stable compound of the $Y_2O_3$-BaO system, $BaCu_2O_3$ is an intimate mixture of BaCuO$_2$ and uncombined CuO.

The reaction kinetics of these phases have been established between 860 and 920°C. The phase evolution has been determined. The crystal structure of the $Y_1Ba_2Cu_3O_x$ obtained powder was studied by means of XRD. According to the results obtained from the kinetics study the $Y_1Ba_2Cu_3O_x$ the synthesis was performed at temperatures of 910-920°C for short treatment times (1-2 hours). Pure $Y_1Ba_2Cu_3O_x$ was prepared, which develops orthorombic type I structure despite of the cooling cycle. Superconducting transition took place at 91 K.

The sintering behaviour and the superconducting properties of sintered samples were studied. Density, microstructure and electrical conductivity were measured. Sintering densities higher than 95% $D_{th}$ were attained at temperatures below 940°C. Relatively fine grained microstructure were observed, and little or no-liquid phase was detected.