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(Bi,Pb)-Sr-Ca-Cu-O glass-ceramics - superconductor and granular metal

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Abstract

In the (Bi,Pb)-Sr-Ca-Cu-O system, materials of various electrical and superconducting properties may be produced by a glass-ceramic method. As a result of heat treatment, amorphous material partially crystallizes. It causes an increase in the size and/or the number of conducting grains and a decrease in the width of the insulating barriers between them. The resistivity of the samples containing small, weakly coupled grains in the normal state follows the exponential temperature dependence of resistivity, while in the samples with larger intergrain conductivities the dependence is logarithmic. Still stronger connections between the grains lead to linear or almost linear $\rho(T)$. The granular character of the $(\text{Bi,Pb})_4\text{Sr}_3\text{Ca}_3\text{Cu}_4\text{O}_x$ materials also influences their superconducting properties.



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