

Topology of superconducting cluster in HTS ceramics

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Experimental studies of electrical conduction of $Y_1Ba_2Cu_3O_{7-x}$ ceramics near its critical state have been carried out by the method of laser point heating. It has been established that near the transition to superconducting state the conductivity of the ceramics shows a cluster character, essentially inhomogeneous in the specimen cross section. The topology of the superconducting cluster and its spatial localization in the specimen have been studied. It has been ascertained that in the direct vicinity of the superconducting transition the whole macro-current flowing in ceramics is concentrated within an infinite cluster that consists of superconducting region coupled by a random network of "weak bonds". This random network is represented as some cell structure characterized by the correlation radius $L \approx 4a$ (a - ceramic granules size). A model of the formation of a superconducting cluster in ceramic superconductors is proposed.