STRUCTURE AND PROPERTIES OF YBCO BEFORE AND AFTER SHORT-TERM EXPOSURE TO THE PLASMA FLOW

Rabadanova A.E.,[*1] ***Gadzhimagomedov S.Kh.,***[1] ***Palchaev D.K.,***[1] ***Ragimkhanov G.B.,***[1] ***Isakaev E.Kh.,***[2] ***Gadzhiev M.Kh.,***[2] ***Demirov N.A.***[2]

[1]*DSU, Makhachkala, Russia,* [2]*JIHT RAS, Moscow, Russia*
[*]*rabadanova.aida@mail.ru*

The structure and properties of a ceramic high-temperature superconductor based on a complex $YBa_2Cu_3O_7$ oxide before and after a short-term exposure to a highly enthalpy flow of argon plasma are studied. These studies are aimed at optimizing the parameters ensuring the surface hardening of products made of highly porous nanostructured ceramics. They are part of research aimed at solving the problem of obtaining high-temperature superconductors with a gradient structure and properties. In the future, the possibility of forming a textured layer with high critical current values will be solved.

Samples of nanostructured ceramics based on $YBa_2Cu_3O_7$ were prepared by sintering at 1193 K for 1 hour of a nanopowder obtained by chemical technology. This technology provides a high proportion of the superconducting phase with an oxygen index of 6.9 in one sintering step. However, despite the possibility of obtaining superconducting samples with densities from 2.5 g/cm^3 to 6 g/cm^3 by this method, they are characterized by low strength, since the contacts between the grains, which are agglomerates of nanoparticles, prove to be fragile. Approbation of hardening of the surface by a plasma flow led to positive results without significant changes in the initial structure and properties of this ceramics associated with oxygen stoichiometry and the recrystallization of nanoparticles. The established optimal processing parameters under the action of a high-enthalpy oxygen plasma flow allow to preserve oxygen stoichiometry, but just as after the action of the argon plasma flow, the ordered distribution of oxygen at the positions that provide the metallic conductivity path is violated.

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