ADVANCED MODERN SUPERCONDUCTIVE MATERIALS FOR THE MACHINES AND DEVICES WORKING ON THE PRINCIPLES OF LEVITATION

T.A. Prikhna, N.V. Novikov, V.B. Sverdun, Ya.M. Savchuk

V. Bakul Institute for Superhard Materials, Nat. Acad. Sci. of Ukraine
(*2, Avtozavodska Str., Kyiv 04074, Ukraine; e-mail: prikhna@iptelecom.net.ua*)

S u m m a r y

By the high-pressure (2 GPa) high-temperature (800—900 °C) synthesis from Mg and B taken in the MgB_2 stoichiometric ratio and with 10 wt.% of Ti, the MgB_2-based nanostructural superconductive material with the record values of critical current density, j_c, and the irreversible fields, H_{irr} ($j_c > 10^5$ A/cm^2 at 10 K in the fields up to 4.6 T and at 20 K up to the fields of 3 T; at 10 K in the 10-T field, $j_c = 10^3$ A/cm^2; at 20 K, $H_{irr} \approx 8$ T) has been obtained. The samples have high density (99 %) and high mechanical properties (the Vickers microhardness was H_v=16.85 GPa under the 4.9-N load). Using powdered $TmBa_2Cu_3O_{7-\delta}$ as a solder, the superconductive junctions with reliable high properties have been produced: the critical current density in the place of a seam was more that 10 кA/cm^2 at 77 K in the magnetic fields up to 1.8 T, the Vickers microhardness and bending strength of the seam are similar to those of the joined material: H_v=4.6 GPa under the 1.96-N load and 28—32 MPa, respectively. The superconductive and mechanical properties of the seam and the material after the joining do not yield to the properties of the initial MT-YBCO.