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Heat treatment of MgB₂ superconductors with different metal sheaths

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The superconductors based on magnesium diboride have a lot of advantages in compare with traditional ones, such as relative simplicity of the superconducting compound synthesis process, small weight of finished product, possibility to manufacture superconductors in form of wires and tapes, absence of superconducting properties anisotropy. In this work the results of manufacture and study of MgB₂ superconductors, which metal sheathes differ by mechanical and physical-chemical properties, were presented. Inside of sheath there was Mg and B powders mix in required proportion. The series of annealings of produced superconductor samples has been carried out at temperatures from 650 to 7000C within from 15 to 60 minutes. After heat treatment, the microstructure of the formed compound has been studied by the scan electron microscopy method and critical temperature of superconductors has been also measured. It was established, that the minimal temperature of superconducting MgB₂ compound synthesis, depends on physical-chemical properties of the metal sheathes. It is necessary to increase the heat treatment temperature up to 7000 C for wires which sheathes material has low value of heat conductivity but the temperature of heat treatment can be 6500 C if the cover material has heat conductivity value close to one of copper. Critical temperature of produced superconductors after heat treatment by optimal regime was 38.5 K that was close to theoretical value – 39 K.

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