Nanocomposites and nanomaterials

Synthesis of MgB2-based superconducting materials with Zr at a pressure of 2 GPa

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It is known that magnesium diboride superconducting properties (such as critical current density and irreversibility field) can be modified by adding metals [1-2]. We have implemented experimental studies synthesis of a superconducting material at high pressures and temperatures with the addition of Zr – up to 10%. It was found that the critical current density in a material under zero magnetic fields was 10^6 A/cm^2 at 10 K and 7×10^5 A/cm^2 at 20 K. The material is characterized by high resistance to strong magnetic fields. The critical current density at 10K 10^4 remains to 7.5 T. The study of the formation mechanism of the phases showed that the dependence of the superconducting characteristics of the addition of Zr explained by two factors. First, the addition of Zr results creates more number of inclusions MgB_{12}. Second, there are take place the formation of zirconium hydride, which prevents the formation of magnesium hydride. However, this mechanism is limited temperature interval 750-800 °C. Material synthesized at higher temperatures does not differ in their characteristics from pure magnesium diboride. Furthermore, it was found that during the synthesis of the material is no diffusion of Zr.

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2. *Prikhna T.A., Gawalek W., Savchuk Ya.M., Moshchil V.E., Sergienko N.V., Habisreuther T., Wendt M., Hergt R., Schmidt Ch., Dellith J., Melnikov V.S., Assman A., Litzkendorf D., Nagorny P.A.* High-pressure synthesis of MgB_2 with addition of Ti // Phisica C. – 2004. – **402.** – p. 223-233.