

Nanocomposites and nanomaterials

Formation of MgB_{12} and AlB_{12} under high pressure and temperature

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Experimental studies of formation of the MgB_{12} and AlB_{12} phases under high pressure (2 GPa) were performed in depending on the synthesis and sintering parameters, first of all, the temperature and time. It was found that high pressure prevents the evaporation of aluminum, just like magnesium [1]. In both cases, the material consists of inclusions of higher borides and phases with increased oxygen content [2]. In the case of sintering AlB_{12} at a temperature of 1200 °C and 2 GPa for an 10 min, a material is formed comprising 80% αAlB_{12} , 20% Al_2O_3 , has a density of 2.65 g/cm³, additive porosity 1.6 % and hardness under load 26-35 GPa.

In the case of MgB_{12} synthesis at the same temperatures and pressures from magnesium and boron (stoichiometric ratio) for a 1 hour allowed to obtain a material with a hardness of 27-30 GPa. In addition to phase MgB_{12} , the sample contains a certain amount of oxide, diboride and other higher borides, the amount of which are increases by increasing the synthesis time. There is a chemical reaction of disproportionate.

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