

MgB₂ Superconductors with Addition of ZrB₂ and Different Carbon Sources

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Abstract - MgB₂ has been catching the attention due to the possibility to apply the material in magnets and electronic devices, operating with cryocoolers. In this work, MgB₂ bulks were developed and analyzed with addition of ZrB₂, another diboride with the same C32 hexagonal structure as MgB₂, and simultaneous addition of different carbon sources (SiC, graphite, and carbon nanotubes). The objective of these additions is to modify the Mg planes with the diborides and to dope the material with carbon, improving the upper critical fields. Besides the doping of the material, this method creates crystalline defects in the superconducting matrix, which can act as pinning centers. As a result we could improve the critical current density of the material and estimate the behavior of dopants on the superconducting properties.

Keywords - MgB₂, bulk superconductors, carbon doping, critical currents, ball milling, cold isostatic pressing