Microencapsulation of Magnesium and Boron Powders for the Synthesis of Magnesium Diboride

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Magnesium powders are highly reactive at room temperature and very volatile at elevated temperatures near melting point. This causes some difficulty in synthesizing superconducting magnesium diboride via in-situ reaction of magnesium with boron. It is thus desirable to coat the surface of magnesium with a protective layer of polymer for controlled synthesizing reaction. In the present work, both magnesium and boron particles were coated with cellulose-based polymers. The microencapsulation was carried out by mixing of magnesium/boron powders with cellulose-based polymers dissolved in the organic solvent such as dimethylformamide. Ethanol was then added to the mixture to precipitate polymers on the surface of magnesium and boron. The resulting encapsulated powders exhibited a quite good thermal and chemical stability up to ~300°C. The microencapsulated powders were mixed to give a stoichiometric composition of magnesium diboride, followed by a die compaction. The pellets were then in-situ reacted at different temperatures to form superconducting phase. The encapsulated powders as the starting material resulted in improved superconducting properties due to the controlled reaction of active materials.