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Synthesis of Nanoscale Magnesium Diboride Powder

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A procedure has been developed for the preparation of small grained magnesium diboride (MgB_2) powder by reacting nanometer size boron powder in a magnesium vapor. Plasma synthesized boron powder that has particle sizes ranging from 20 to 300nm was mixed with millimeter size chunks of Mg by rolling stoichiometric amounts of the powders in a sealed cylindrical container under nitrogen gas. This mixture then was placed in a niobium reaction vessel, evacuated, and sealed by e-beam welding. The vessel was typically heated to approximately 830oC for several hours. The resulting MgB_2 particles have a grain size in the 200 nm to 800 nm range. Agglomerates of loosely bound particles could be broken up by light grinding in a mortar and pestle. At 830oC, many particles are composed of several grains grown together so that the average particle size is about twice the average grain size. Experiments were conducted primarily with undoped boron powder, but carbon-doped boron powder showed very similar results.

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