SYNTHESIS AND OPTICAL PROPERTIES OF MAGNESIUM DIBORIDE FILMS

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Advances in our understanding of the recently discovered superconductor MgB$\sub{2}$ with T$\sub{c}\approx$39K hinge critically on the availability of high-quality samples. Despite the considerable effort that has been devoted to the growth of thin films of MgB$\sub{2}$, we still lack a complete understanding of the nucleation and growth mechanisms, and challenging issues remain related to magnesium volatility and reactivity with oxygen. Samples obtained by an ex-situ reaction of e-beam evaporated boron films with magnesium have been used to determine the far-infrared optical properties. These measurements indicate that a simple BCS picture of superconductivity is in fact inappropriate for MgB$\sub{2}$, and in particular reveal a superconducting gap 2Δ about one-half of that expected from BCS theory. Further advances in the growth and processing of MgB$\sub{2}$ both by ex-situ (based on e-beam evaporation of boron) and in-situ approaches (based on pulsed laser deposition) will be discussed in detail.
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