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Properties of Carbon Doped MgB_2 Films by HPCVD Using TMB

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— Carbon-doping is an effective way to enhance the upper critical field of MgB_2. Our previous carbon-alloyed MgB_2 films using $(MeCp)_2Mg$ as the carbon source show dramatically increased $H_{c2}^{||}$ values to over 60 T at low temperatures. Structure analyses of these films indicate that only part of the carbon is doped into the MgB_2 lattice and the rest forms highly resistive foreign phases in the grain boundaries. To fabricate more homogeneously carbon doped thin films, gaseous trimethylboron (TMB) was used as the carbon source. The normal state resistivity of carbon doped films using TMB increases much more slowly with carbon concentration, demonstrating a better connection between the MgB_2 grains. However the relatively high growth temperature, required to decompose TMB, limits the film thickness in the original Hybrid Physical-Chemical Vapor Deposition (HPCVD) setup. A hot wire is then installed in the HPCVD system to help decompose TMB while the substrate and Mg bulk source are kept at relatively low temperature. Initial results of these films will be presented.

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