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Progress of MgB_2 Superconductor

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Our continuous efforts to increase the performance of MgB_2 wires over the past few years are summarized in Figure 1. Stoichiometric binary MgB_2 wires with various sheath materials and different numbers of filaments were first fabricated. Then, wires with 10% excess Mg plus SiC dopant ($Mg_{1.1}B_2$-SiC), 15% excess Mg only ($Mg_{1.15}B_2$), and 15% excess Mg plus a SiC dopant ($Mg_{1.15}B_2$–SiC) were introduced. However, the best critical current density, J_c, was limited to 10^5 Acm^{-2} at 6 T and 10^4 Acm^{-2} at 11.5 T, respectively. Now with the malic acid doping (MgB_2-10wt% $C_4H_6O_5$), J_c values as high as 10^5 Acm^{-2} at 6.8 T and 10^4 Acm^{-2} at 11.7 T, comparable to those of commercial NbTi wires are achieved. The J_c is about 25,300 Acm^{-2} at 4.2 K and 10 T. However, much more attentions and efforts are still needed for real applications. Very recently, a cold high pressure densification has been suggested as an alternative way to enhance the mass density after a mechanical deformation process. The J_c at 4.2 K was reported to be further increased to ~40,000 Acm^{-2} for a malic acid doped conductor sintered at 600°C for 4 hours.

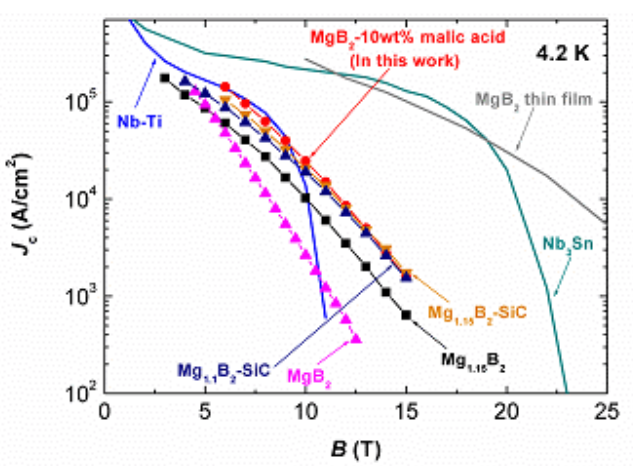

Figure 1. Comparison of J_c-B characteristics at 4.2 K of the malic acid doped wire with those of other commercial MgB_2 wires fabricated by the Hyper Tech Research. The malic acid doped MgB_2 wire sintered at 600°C for 4 hours. The critical current density was about 25,300 Acm^{-2} at 4.2 K and 10 T.