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Flux Pinning and Connectivity in MgB2 M.D. SUMPTION, M. SUSNER, M. BHATIA, E.W. COLLINGS, Materials Science Department, Ohio State University — The transport and pinning properties of in-situ MgB2 bulks and strands are discussed. The influence of SiC, excess Mg, B4C, TiC, and their combination on Birr and Bc2 as distinct from connectivity and flux pinning is the focus of the work. SiC dopants increase Bc2 and Birr predominantly, with little influence on connectivity or flux pinning. Excess Mg improves the transport current, changes the grain microstructure, and also leads local maxima in Bc2 and Birr at excess Mg levels of 15% mol fraction. Fp curves are consistent with grain boundary pinning for the binary materials over the whole temperature range. This is also true for SiC and TiC doped materials at lower fields and temperatures, while higher temperatures show a deviation from surface pinning. These higher temperature deviations are consistent with the size and distribution of these nanoparticulate additions. Normal state resistivity measurements and models are used to extract residual resistivity values, percent connectivity, and Debye temperatures. Debye temperatures are seen to be depressed by SiC doping, an effect which is confirmed by heat capacity measurements. Residual resistivity values are seen to correlate with Bc2 and Birr enhancements, consistent with B site substitution with C as evidenced by XRD extracted lattice parameter shifts.

M.D. Sumption
Ohio State University

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