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Effects of Grain Size and Doping Level on the Critical Current Density of the Ti-sheathed MgB_2 Superconducting Wires with SiC Doping GAN LIANG, HUI FANG, CAD HOYT, Sam Houston State University, Z. P. LUO, Texas A&M University, F. YEN, M. HANNA, A. ALESSANDRINI, K. SALAMA, University of Houston — The effects of the grain size and doping level on the critical current density (J_c) of the SiC-doped Ti-sheathed MgB_2 superconducting wires were studied. Two groups of samples were prepared: for the first group, the average size of the SiC grains was 20 nm and the doping levels were 5%, 10%, and 15%; for the second group, the doping level of the SiC dopant was 10% and the average sizes of the SiC particles were 20 nm, 43 nm, and 123 nm. All of the samples were sintered at 800 C for 30 minutes. Contrary to the J_c results reported on the SiC-doped Fe-sheathed MgB_2 wires by some other groups, we found that the J_c for the SiC-doped Ti-sheathed MgB_2 wires decreases with both the increase of SiC concentration and the decrease of the grain size. Only for the wires with average grain size of 123 nm, J_c is greater than that of the un-doped MgB_2 wires. A simple model is proposed to explain the formation of the impurities in the cores of these doped MgB_2 wires. This unusual dependence of J_c on the size and doping-level of the SiC dopant is discussed in association with the magnetization, resisitivity, XRD, TEM, and SEM results.

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