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c-Axis current flow arises in helically wound wire YING JIA, U. WELP, G.W. CRABTREE, W.K. KWOK, Materials Science Division, Argonne National Laboratory, Argonne, IL 60439, USA, M. RUPICH, S. FLESHLER, A.P. MALOZEMOFF, American Superconductor Corp., 64 Jackson Road, Devens, MA 01434-4020, USA — c-Axis critical current density of second-generation YBCO wires in HTS cables due to the interaction of current flow with the induced magnetic field. However, the importance of c-axis critical current density (J_c^c) on the overall transport critical current is not clearly understood. We measured the temperature and field dependence of J_c^c using a mesa structure patterned into the YBCO layer of 2^{nd}-generation HTS tapes. We found, J_c^c –values of $\sim$ 4 kA/cm^2 at 77 K in self-field, corresponding to an unexpectedly high anisotropy of the critical current density $\gamma = J_c^{ab}\Big/J_c^c = 500\sim600$. We also investigated the effect of pinning microstructures on J_c^c and γ. Our result shows a direct correlation of J_c^c (77 K, sf) and γ to the density of stacking faults. An estimation reveals that the fraction of tape width associated with c-axis current flow grows linearly from 5% to 20% with increasing γ for a typical geometry and could affect the performance of power transmission in HTS cables.

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