

Effect of ferromagnetic substrates on ac losses in YBCO coated conductor tape.

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Long tapes of bi-axially oriented films of $\text{YBa}_2\text{Cu}_3\text{O}_{7-y}$ (YBCO) deposited on a variety of metallic substrates, so-called “coated conductors,” are presently considered the most promising embodiment for next generation high temperature superconducting wire for electric power applications. One common method of inducing quasi-epitaxial growth of YBCO films is to first metallurgically texture the grain orientation of the supporting tape substrate followed by deposition of an insulating perovskite buffer layer which “transmits” the crystallographic order so induced to the final YBCO overlayer. To date, optimal critical current densities have been obtained on substrates comprised of nickel, a ferromagnet. We have calculated the dissipative loss arising from such a ferromagnet substrate due to magnetic domain wall motion induced when coated conductors would be used for alternating current applications, and compare them with other sources of ac losses such as addenda eddy currents and vortex lattice hysteresis within the superconductor itself.