Magnetism and Ferromagnetic Loss in Ni-W Textured Substrates for Coated Conductors

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Magnetism and ferromagnetic loss in Ni-W textured substrates for coated conductors A.O. IJADUOLA[+], J.R. THOMPSON[+,*], [+]Dept of Physics, University of Tennessee, Knoxville, TN and [*]Oak Ridge Natl Lab, Oak Ridge, TN, A. GOYAL[*], C.L.H. THIEME, American Supercond. Corp., Westborough, MA, K. MARKEN, Oxford Inst. Supercond. Tech., Carteret, NJ — We studied magnetic properties of biaxially textured $Ni_{1-x}W_x$ materials with $x =$ 0, 3, 5, 6, and 9 at% W. They are important as substrates for "RABiTS" coated conductors containing high temperature superconductors. The quasi-static dc and ac hysteretic loss W was determined to estimate the ferromagnetic (FM) contribution to the overall ac loss in applications. Alloys were prepared by vacuum casting or powder metallurgy, and the hysteretic loss tended to be lower in materials that were recrystallized at higher temperatures. Progressive deformation (0.4 % bending strain) to simulate winding operations increased the FM loss, as did sample cutting operations making localized damage. In ac studies, the effects of ac frequency and DC bias field on the FM loss were determined. For fully coated tapes (with no effective "grooving"), estimates of ac loss show that the FM part can be modest compared with the superconductive loss, for peak ac currents $I_0 \sim (0.6 - 0.8)I_c$, where $I_c =$ critical current. Work at UTK was supported by AFOSR Grant F49620-02-1-0182. ORNL is managed by UT-Battelle, LLC for the USDOE.

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