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Tue-Mo-Po2.09-01 [63]: Influence of GdBCO stoichiometry on the superconducting properties of industrial 2G HTS wire in magnetic field

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We prepared a series of 2G HTS wires with systematically varying gadolinium content in the GdBCO layer grown by pulsed laser deposition (PLD) and characterized by them by transport Ic measurements over wide ranges of temperature (T) and magnetic field (H). The samples were fabricated using commercial production equipment at SuperOx and contained different concentration of Gd, starting from the standard production composition and with additions of 15, 30 and 45% of excess Gd. The critical current was density determined from hysteresis loops using PPMS in the 0-8 T field range from and at temperature from 4.2 to 77 K. The resistivity curves of the samples were also measured using PPMS in the field range from 0 to 9 T in the orientation from H||c (θ = 0°) to H||ab (θ = 90°) at 30° increments. In this case, the curves were obtained by the 4-probe technique with a 100 mA measuring current. From these curves the irreversibility temperature, Tirr, was derived as the beginning of the resistive transition. We replotted the Tirr(H) curves as irreversibility field lines Hirr(T) and scaled those data using the relation for the effective field for rotated sample: H_eff=H*√(γˆ2〖sin〗ˆ2 θ+〖cos〗ˆ2 θ). The activation energy, Ua, derived from the log(ρ/ρ0) against 1/T plots was almost constant in the whole angular range, with a small peak at H||ab. The Ua(θ) curves looked similar for all samples; the activation energy as well as the critical temperature decreased with the increase of gadolinium content. The real (χ') and imaginary (χ") part of magnetic susceptibility were measured in the 0-3 T field range. At high magnetic field the transition of χ'moves to low temperature and becomes wider for all samples. The maximum of χ"also appreciably moves to low temperature. The obtained experimental results are evidence of different pinning structure mechanism in the samples.

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