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Tuning Vortex Creep in Irradiated $YBa_2Cu_3O_{7-\delta}$ Coated Conductors SERENA ELEY, Los Alamos National Laboratory, KAREN KIHLSTROM, SIGRID HOLLEIS, MAXIME LEROUX, Argonne National Laboratory, MARTIN RUPICH, American Superconductor Corporation, DEAN MILLER, Argonne National Laboratory, ASGHAR KAYANI, Western Michigan University, ULRICH WELP, WAI-KWONG KWOK, Argonne National Laboratory, LEONARDO CIVALE, Los Alamos National Laboratory — $YBa_2Cu_3O_{7-\delta}$ coated conductors (CCs) show non-monotonic changes in the temperature-dependent creep rate, $S(T)$, due to mixed pinning landscapes comprised of twin boundaries, planar defects, point defects, and nanoparticle precipitates. Notably, in low fields, there is a conspicuous dip in S as T increases from ∼20K to ∼65K. The source of this dip is poorly understood. Moreover, pinning landscapes that are favorable for high critical currents, J_c, are not necessarily optimal for low S. We have found that, though oxygen irradiation introduces few-nm-sized defects that result in significant increases in J_c, it is detrimental to creep, increasing S (reducing the dip depth) for T >20K. Understanding the source of this dip is crucial to engineering pinning landscapes that concurrently promote high J_c and low S. To this end, we study changes in $S(T)$ as we tune the ratio of smaller (point to few-nm-sized) defects to larger nanoparticles in an oxygen-irradiated CC by annealing in O_2 at 250C to 600C. We observe a steady decrease in $S(T$ >20K) with increasing annealing temperature. This suggests that pre-existing nanoparticle precipitates are likely responsible for the dip in $S(T)$, and underlines the fact that the effects of defects are not additive, but rather can be competitive.

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