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The Significance of Edge-Barrier Pinning in Superconducting Bridges PAUL BARNES, WESLEY JONES, MATTHEW MULLINS, FRANCISCO BACA, TIMOTHY HAUGAN, Air Force Research Laboratory — Edge-barrier pinning in thin superconducting films provides additional pinning over that of the bulk pinning. When using bridges greater than 1 μm to determine the critical current density (J_c) of films, this additional pinning is typically ignored. However, theoretical and experimental data presented here indicate that this pinning enhancement is non-negligible with bridge widths of less than 100 μm and on par with the bulk pinning at a few microns. In the present study, bridges in $YBa_2Cu_3O_{7-\delta}$ (YBCO) thin films were repeatedly narrowed to avoid issues of sample to sample variation. Bridge widths starting at 500 μm and 50 μm were patterned by photolithography with subsequent narrowing performed by photolithography and focused ion beam milling, respectively. Transport J_c was determined after each bridge size. Theoretical analysis follows that of J.R Clem [e.g. Elistratov et al, Phys. Rev. B 66, 220506 (2002)]. Theoretical implications of the narrow bridge effect on J_c(H) and J_c(T) plots are not simple scalar changes. Based on these results presented here, two key points are: 1) J_c data comparison among institutions using different bridge sizes can provide improper conclusions (similarly as not accounting for film thickness), and 2) the J_c(T) and J_c(H) curve shapes are skewed differently for different widths. The implication of these effects will be discussed.

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