

T_cSAM Bi-Weekly Brown Bag Seminar

Texas Center for Superconductivity and Advanced Materials
at the University of Houston

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Higher J_c at Reduced Pinning Potential

Friday, April 16, 2004

Room 102, Houston Science Center

12:00 p.m. – 1:00 p.m.

Abstract

In a decade of study it has been frequently noted that continuous columnar pinning centers provide the largest pinning potential, U_{pin} . It has been assumed therefore that such pinning, e.g., created by ions, provides the highest values of J_c , and pinned field, B_{pin} . Generally, studies of columnar pinning are discontinued at pinning center densities beyond which J_c is observed to decrease. It has also been broadly noted that such decrease is due to degradation of the order parameter and the critical current, T_c . We previously reported theoretical findings that J_c and B_{pin} were limited by the pinning center microstructure, not T_c , and could be markedly improved by reducing the damage incurred in the formation of pinning centers, even though U_{pin} is reduced in the process. We now report experimental results. Spatially discontinuous melting occurs for ions having $S_e \equiv dE/dx \geq 0.7 \text{ keV/\AA}$. This becomes continuous for $S_e \geq 3.5 \text{ keV/\AA}$. We studied the interval $1.4 \leq S_e < 4.0 \text{ keV/\AA}$, using parallel ions (no splay). We find J_c is higher by a factor of 6 at $S_e \sim 2.0 \text{ keV/\AA}$ (intermittent columns) than at $S_e \sim 3.5 \text{ keV/\AA}$ (continuous columns), despite the fact that U_{pin} is reduced by $\sim 75\%$ at the lower S_e . In addition, pinnable field is increased by factors > 10 at the lower S_e . Future basic studies and application to current problems of interest will be discussed.

Persons with disabilities who require special accommodations in attending this lecture should call (713) 743-8210 as soon as possible.

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