Session 27aE

Superconducting Transition and Vortex Pinning in Nb Films Patterned with Nano-scale Hole-arrays **27aE1**

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Nb films containing extended arrays of holes with 45-nm diameter and 100-nm spacing have been fabricated using anodized aluminum oxide (AAO) as substrate. Pronounced matching effects in the magnetization and Little-Parks oscillations of the superconducting critical temperature are seen in fields up to 9 kOe. Flux pinning in the patterned samples is enhanced by two orders of magnitude as compared to unpatterned reference samples in applied fields exceeding 5 kOe. Matching effects are a dominant contribution to vortex pinning at temperatures as low as 4.2 K due to the small spacing of the holes.

Vortex Matter in Nanostructured Superconductors **27aE2**

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Flux confinement has been studied in individual superconducting nanoplaquettes, their clusters and huge arrays (films with nanoengineered periodic pinning arrays (PPA)). In individual nanoplaquettes of the different form (loops, discs, triangles and squares) the superconducting critical temperature $T_c(H)$ was measured resistively and also calculated from the linearized Ginzburg-Landau equations. Novel symmetry consistent vortex-antivortex patterns have been found for triangles and squares. In films with the PPA (lattices of antidots or magnetic dots) the combination of the local probe techniques with the bulk probes has made it possible to identify correctly all vortex patterns responsible for the strong enhancement of the critical current.

27aE3 Irradiation Induced Changes in the Vortex Phase Diagram of YBCO

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The vortex phase diagram of YBCO was explored with electrical transport and ac specific heat measurements. The evolution of the phase diagram with increasing defect density and varying defect geometry is discussed, with a particular emphasis on the critical points of the first order vortex melting line.

27aE4 Dynamic Phase Diagram of Vortices in high-T_c superconductors determined by Experimental Studies

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Dynamic phase of driven vortex lattice of high-T_c cuprate, $Bi_2Sr_2CaCu_2O_y$, was investigated by noise measurement and ac-dc interference measurement. We obtained the magnetic field (B) - temperature (T) - driving force (F) diagram of the dynamic phase[1]. The obtained phase diagram was rather different from that of conventional superconductors and the theoretically expected diagram. We argue that the diferences are characteristic of in high-T_c cuprates. We will also compare the dyanamic phase diagram with that for CDW systems, and discuss the implications for physics of friction.

[1] Y. Togawa *et al.*: Phys. Rev. Lett. 85 (2000) 3716, A. Maeda *et al.*: Phys. Rev. B65 (2002) 54506, Y. Togawa *et al.*: *submitted*.