

## *The critical current problems in the HTc superconductors*

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In the paper are given new results of the investigations critical current limitations in the high temperature oxide superconductors. New model of the pinning interaction nano-sized centers with pancake vortices is proposed and its results concerning the influence of magnetic field, temperature and bending strain on the critical current are given. The related electromagnetic problems arising during the current flow through the HTc superconductors, such as losses of power and normal zone development are considered too. The limitation of the current transport due to the pinning interaction of vortices with the nano-sized centers is considered in the strong correlation to the results of the performed scanning electron microscopy of the superconducting Bi-2223 tape. The subject of the magnetic flux penetrating the captured vortices is analyzed and influence of this effect as well as of the initial position of the captured vortex on the critical current calculated. Some results are shown in Fig. 1. The case of the nano-sized pinning centers is analyzed, for which the variation of the screening currents in the captured vortices is significant. It should lead then to the change of the magnetic field distribution in the vortex core. The results of calculations indicate directly on the importance of the effect of the magnetic flux variation and initial position of the captured vortex on the critical current of superconducting material.

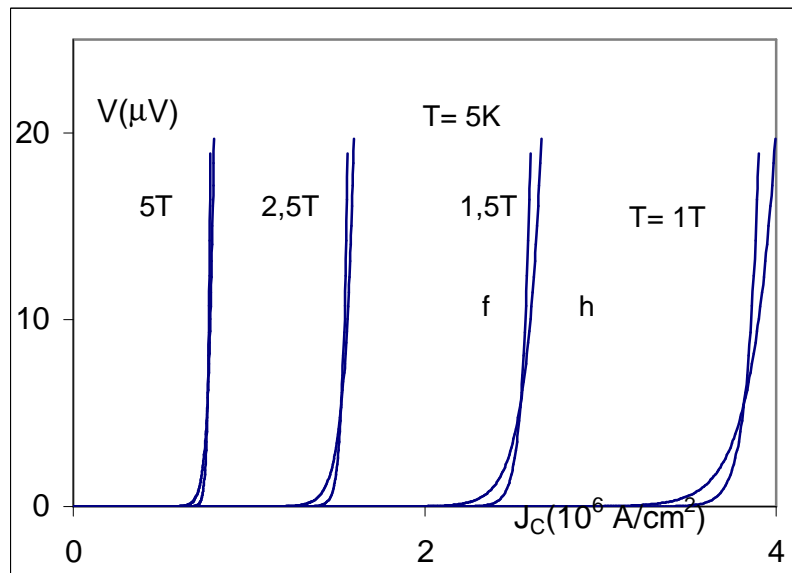


Fig. 1. The current-voltage characteristics of the HTc superconductor with half pinned vortex (h) in initial state or fully pinned (f) for  $d/2\xi = 0,4$  versus applied external magnetic field.