Highlights

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Current Induced Resistive State in Fe(Se,Te) Superconducting Nanostrips

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We studied the current-voltage characteristics of Fe(Se,Te) thin films deposited on CaF_2 substrates in form of nanostrips (width w ~λ, λ the London penetration length). Our focus was on the transport properties of Fe(Se,Te) films in small magnetic field, the one generated by the bias current. From the analysis of the characteristics taken at different temperatures we estimated the pinning potential *U* and the pinning potential range δ for the magnetic flux lines (vortices). Since the sample lines are very narrow we found that the classical creep flow model provided a sufficiently accurate interpretation of data only when the attractive interaction between magnetic field lines of opposite sign was taken into account. The observed voltages, and the induced suppression of the critical current of the nanostrips, were compatible with the presence, at the equilibrium, of a low number (<10) of magnetic field lines, a strongly inhomogeneous current density distribution at the two strip ends, and a reduced Bean Livingston barrier. In particular we argued that the sharp corners defining the bridge geometry were points of easy magnetic flux line injection. The role of superconducting banks confining the strips was also discussed. The results are relevant to creep flow analysis in superconducting Fe(Se,Te) nanostrips for micro-electronics applications.

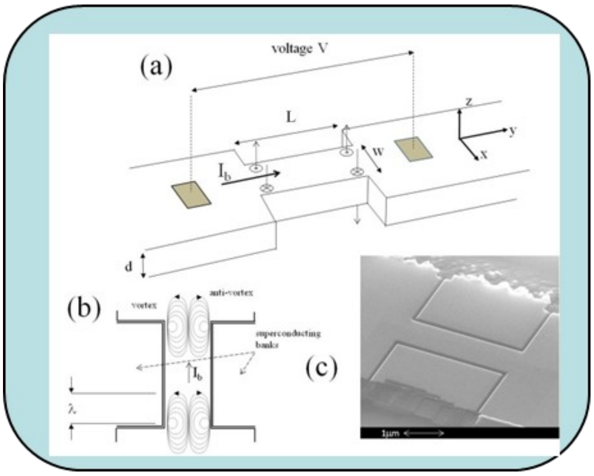

Fig.1: (a) Geometry of the nanostrips used in the work. (b) Schematic of the streamlines of the vortex and anti-vortex current densities. (c) A SEM image of sample B (*w*=800nm).

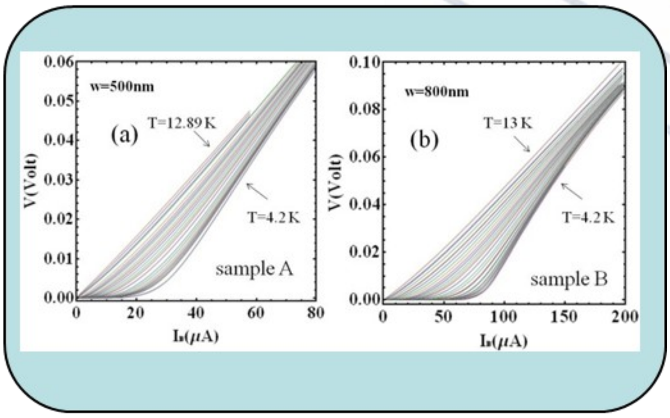

Fig.2: Current voltage characteristics of the nanostrips in the indicated range of temperatures. (a) Sample A, *w*=500nm. (b) Sample B, *w*=800nm. Both samples were 3μm long.

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