SUPERCONDUCTOR 3D NANOARCHITECTURES

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Advances of high-tech fabrication techniques have allowed for generating geometrically and topologically nontrivial manifolds at the nanoscale, which determine novel electronic, magnetic, optical and transport properties of such objects due to their complex geometry and non-trivial topology [1]. 3D superconductor (SC) nanoarchitectures, with unconventional vortex configurations, are promising for the future efficient and multifunctional technologies. A topological transition between the vortex and phase-slip regimes determines the magnetic-field–voltage characteristics revealing a nontrivial topology of SC screening currents. An abrupt switch-on of the transport current triggers the transition from the vortex to phase-slip regime. A novel hysteresis effect is unveiled in the current–voltage characteristics of SC open nanotubes [2]. Dynamic topological transitions in SC open nanotubes take place under a combined dc+ac transport current [3]. Various vortex chains, vortex jets, phase-slip regimes [4] occur in SC open nanotubes due to the inhomogeneity of the normal magnetic field component. Efficient steering of vortex chains and jets in SC open nanotubes is provided by tilting of the magnetic field [5].

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