Effect of surface and bulk pinning on the distribution of transport current in superconductors

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Abstract

We show, both experimentally and theoretically, that the inhomogeneous distribution of transport current produced by two contacts located at the opposite corners of a square film is significantly changed as the film becomes superconducting (the total current I flowing through the sample is kept constant). We analyze two possible sources for such a current redistribution: (1) the nonlinear dependence of the resistivity ρ on the current density j, and (2) the effect of surface barriers. In the above geometry these sources have the opposite effect and compete with each other. This technique can be easily modified for various sample and contact geometries and is useful for the analysis of pinning and creep of vortices in superconductors.