# Separation of surface- and bulk-related transport behaviour of $Bi_2Sr_2CaCu_2O_8$

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## Abstract

The transport properties of single crystals of $Bi_2Sr_2CaCu_2O_{8+\delta}$ are affected by surface barriers (SB) in both the solid and liquid vortex phases. The effects of the SB on the measured resistance in the liquid state are pronounced, even up to fields of order of 1 Tesla. This results in a strongly non-linear resistance and has complicated extraction of bulk-related parameters including the activation energy. Thus it has also acted to obscure additional possible transitions in the vortex lattice [Fuchs *et al.*, Phys. Rev. Lett. **80**, 4971 (1998)]. Two sample geometries which allow bulk- and surface related properties to be separated have been investigated. By comparing the resistive transition of a large plate-shaped sample with a strip cut from it, the bulk resistance is shown to be as much as 2 orders of magnitude larger than the surface-barrier related resistance in the strip sample. Finally, we present remarkable data in the Corbino disk geometry. In this geometry vortices do not ever cross the sample edges and the barriers are avoided altogether, allowing direct access to bulk properties.