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Manipulation of quantum vortex states by local supercurrent injection into mesoscopic superconductors AKINOBU KANDA, University of Tsukuba, MILORAD V. MILOSEVIC, Universiteit Antwerpen, SHINYA HATSUMI, YOUTI OOTUKA, University of Tsukuba, FRANCOIS M. PEETERS, Universiteit Antwerpen — When vortices are confined in a small space, they take a formation which is quite different from that of bulk samples; the vortices tend to be arranged to fit the sample shape (multivortex state (MVS)), and/or, when the confinement is strong enough, a multiply-quantized vortex called a giant vortex may appear (giant vortex state (GVS)). In most studies, transitions between vortex states take place by the change in magnetic field or temperature. For the manipulation of the vortex states, however, temperature or magnetic fields are not necessarily suitable parameters. In this talk, I report a trial to induce vortex state transitions by local supercurrent injection into mesoscopic superconductors. Samples are thin mesoscopic superconducting square made of Aluminum, and the multiple-small-tunnel-junction (MSTJ) method is used to detect the vortex states. We have succeeded in inducing vortex penetration/expulsion, and transitions between a GVS and an MVS or between different MVSs with a fixed vorticity. The details of the transitions and possible applications of current-induced transitions will be discussed.

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