Oscillatory Josephson-Vortex Resistance in Stacks of $Bi_2Sr_2CaCu_2O_{8+x}$ Intrinsic Josephson Junctions

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We report the observation of the periodic oscillation of the Josephson-votex-flow resistance in rectangular stacks of $Bi_2Sr_2CaCu_2O_{8+x}$ (Bi-2212) intrinsic Josephson junctions. A piece of Bi-2212 single crystal containing a few tens of intrinsic junctions was sandwiched between two gold electrodes and fabricated into a rectangular shape with the typical lateral size of about 2x10 μm^2 using the combination of e-beam lithography, wide and focused ion-beam etching. In a tesla-range magnetic field applied in parallel with the junction planes the oscillation of the vortex-flow resistance was observed at temperatures in a wide range near 60 K. The oscillation results from the interplay between the triangular Josephson vortex lattice and the potential barrier at the boundary of a single crystal. We present the oscillation for varying bias currents, external magnetic fields, and temperatures. The tilt-angle dependence of the vortex dynamics will also be discussed.

keywords : Josephson vortex, Josephson vortex-flow resistance, tunneling magnetoresistance oscillation, boundary vortex potential