Single-Fluxon Controlled Resistance Switching in Centimeter Long Nanowires

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Resistance measurements were made as a function of temperature and magnetic field on a 6 mm long Ga-In eutectic nanowire confined in a hollow glass fiber of 150nm inner diameter. Novel hysteretic switching between stable superconducting and resistive states are seen. The nonzero resistance occurs when a Ga nanodroplet spontaneously formed along the length of the nanowire traps one or more superconducting fluxons, thereby driving a Josephson weak-link created by a second nearby Ga nanodroplet normal. This experiment opens the possibility of developing single-fluxon logic and memory devices.