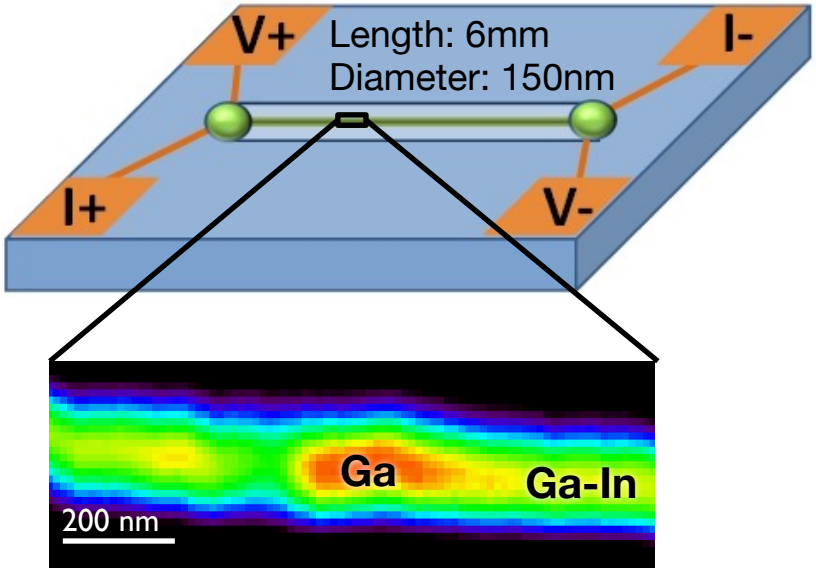
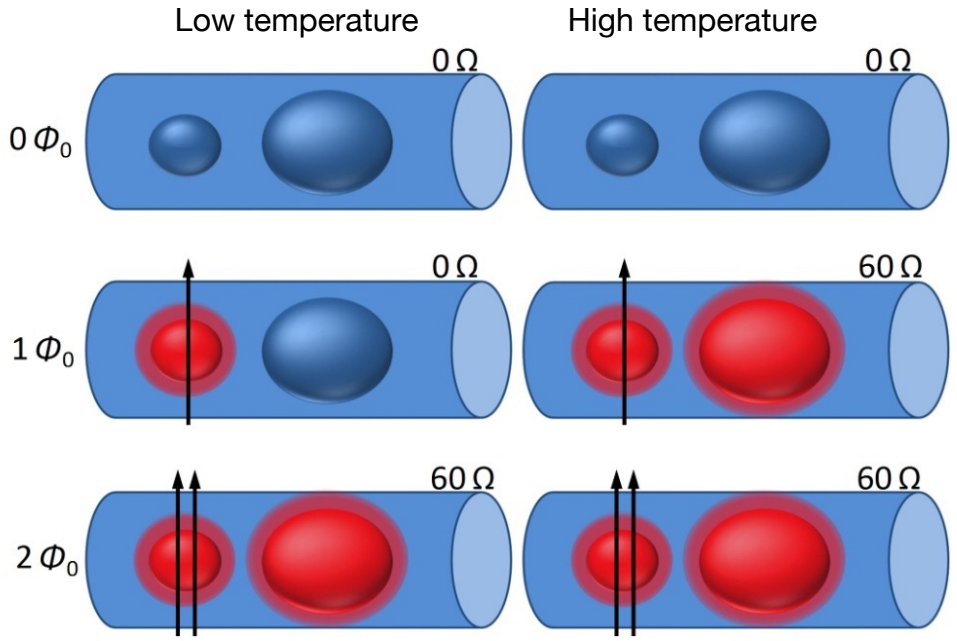
Single-Fluxon Controlled Resistance Switching



Ga is separated from Ga-In eutectic in the glass fiber.



A single superconducting flux quantum or "fluxon" Φ_0 with magnetic moment "↑" can be exploited to switch the resistance of a nanowire between two discrete values, with potential long-term application in creating new switching devices. The MRSEC team has produced extraordinarily long nanowires of superconducting Ga-In eutectic – centimeters in length – who extreme length assists in the formation of spontaneous Ga nanodroplets along the length of the nanowire with the right geometry to capture magnetic flux. Fluxons can be inserted or flipped by careful manipulation of magnetic field or temperature, to produce many metastable states each with different electron transport properties.

DMR-1420620 W. Zhao[1], J. L. Bischof[1], J. Hutasoit[1], X. Liu[1], T. C. Fitzgibbons[1], J. Hayes [2], P.A.J. Sazio[2], C. Liu[1], J. K. Jain[1], J. V. Badding[1], and M. H. W. Chan[1]. Nano Letters 2015, [1]Penn State, [2]Southampton.