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Tunable supercurrent through semiconductor nanowires JORDEN VAN DAM, Delft University of Technology, YONG-JOO DOH, Delft University of Technology, AARNOUD ROEST, Philips Research, ERIK BAKKERS, Philips Research, SILVANO DE FRANCESCHI, TASC-INFM, Trieste, Italy, LEO KOUWENHOVEN, Delft University of Technology — We have developed a high-yield approach to the fabrication of nanoscale superconductor-semiconductor hybrid devices [1]. The devices are assembled from InAs semiconductor nanowires with diameters ranging from 30-130 nm, individually contacted by aluminum-based superconductor electrodes. Below 1 Kelvin, the high transparency of the contacts enables proximity-induced superconductivity. A supercurrent flows though the nanowire that can be tuned by a global gate acting on the electron density. Furthermore, we have used top-gates in order to make tunable barriers in InAs nanowires. By creating two closely spaced barriers in an InAs nanowire, we can define a Quantum Dot (QD) with tunable coupling. This enables us to study a tunable QD connected to superconducting leads. In these devices the supercurrent can be controlled by only a small change in gate voltage. If the QD is tuned at a charge degeneracy point, a supercurrent can flow through the QD. However, away from charge degeneracy the supercurrent is blocked due to coulomb blockade. [1] Y.-J. Doh, J.A. van Dam, et al., Science 309, 272 (2005)

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