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Tuning of the critical current of superconducting nanowires by application of voltage pulses THOMAS AREF, ALEXEY BEZRYADIN, UIUC — The critical current of superconducting nanowires may be dependent on a number of factors such as dimensions of the nanowire, the wire's normal resistance or the presence of magnetic impurities. Determining which factors are most important is key to developing a detailed understanding of the underlying physics of 1D superconductivity. It is experimentally difficult to alter and probe such properties in situ at cryogenic temperatures. We have developed a method for tuning the critical current of a nanowire in situ inside a helium cryostat by the application of short, high bias voltage pulses. These pulses alter the critical current of the nanowire in a controlled manner by annealing or electromigration. Thus, for a single nanowire, we can vary critical current and normal resistance in situ. This process may have applications in developing future superconducting nanowire circuitry such as qubits where precise control of the nanowire's critical current is required. We also investigate the dependence of the critical current on the normal resistance of the wire and compare to existing theories.

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