Abstract Submitted
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**Control of Nanofilament Structure and Observations of Quantum Point Contact Behavior in Ni/NiO Nanowire Junctions**[1] SEAN OLIVER, George Mason University, JESSAMYN FAIRFIELD, SUNGHUN LEE, ALLEN BELLEW, Trinity College Dublin, IRIS STONE, George Mason University, LAURA RUPPALT, Naval Research Laboratory, JOHN BOLAND, Trinity College Dublin, PATRICK VORA, George Mason University — Resistive switching is ideal for use in non-volatile memory where information is stored in a metallic or insulating state. Nanowire junctions formed at the intersection of two Ni/NiO core/shell nanowires have emerged as a leading candidate structure where resistive switching occurs due to the formation and destruction of conducting filaments. However, significant knowledge gaps remain regarding the conduction mechanisms as measurements are typically only performed at room temperature. Here, we combine temperature-dependent current-voltage (IV) measurements from 15 - 300 K with magnetoresistance studies and achieve new insight into the nature of the conducting filaments. We identify a novel semiconducting state that behaves as a quantum point contact and find evidence for a possible electric-field driven phase transition. The insulating state exhibits unexpectedly complex IV characteristics that highlight the disordered nature of the ruptured filament while we find clear signs of anisotropic magnetoresistance in the metallic state. Our results expose previously unobserved behaviors in nanowire resistive switching devices and pave the way for future applications where both electrical and magnetic switching can be achieved in a single device.

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