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Spin transport in metal-oxide switching devices CURT A. RICHTER, Semiconductor and Dimensional Metrology Div, NIST Gaithersburg, MD, H.-JAE JANG, Semiconductor and Dim. Metrology Div, NIST and Dept. of Physics, Wake Forest University, OLEG KIRILLOV, Semiconductor and Dimensional Metrology Div, NIST Gaithersburg, MD, OANA JURCHESCU, Department of Physics, Wake Forest University, Winston-Salem, NC — Metal-oxide-based devices in which resistive switching occurs, often referred to as memristors or resistive-RAM (random oxide memory), show promise for use in technologically exciting applications such as high-density non-volatile memories, electronically reconfigurable logic, and neural networks. We report on electron spin transport through electrochemically precipitated copper filaments formed in TaO_x memristive devices consisting of Co(60 nm)/TaO_x (16nm)/Cu(5 nm)/Py(60 nm) with crossbar-type electrode geometry. These metal-oxide switching devices with ferromagnetic electrodes show memristive behavior having a typical OFF/ON resistance ratio of 10^5. Magnetoresistance measurements performed by sweeping an external magnetic field display evidence of spin transport in the low-resistance ON-state at 77 K. Spin transport vanishes in the OFF-state. These data are strong evidence that the fundamental switching mechanism in these metal-oxide devices is the creation of Cu filaments in the ON-state that completely span the 16 nm thick TaO_x and form a continuous metallic conduction path. In addition to helping elucidate the conduction pathway in these intriguing structures, our findings can advance electronics combining spintronic and electronic functions.

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