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Conduction and Loss Mechanisms in Flexible Oxide-Based Memristors J.L. TEDESCO, N. GERGEL-HACKETT, L. STEPHEY, A.A. HERZING, M. HERNANDEZ-MORA, C.A. HACKER, J. OBRZUT, L.J. RICHTER, C.A. RICHTER, National Institute of Standards & Technology — In order to study the conduction and loss mechanisms behind their operation, flexible sol-gel based memristors were fabricated with differing oxide film thicknesses and device sizes. XPS, TEM, EELS, and VASE measurements indicated the oxide was amorphous TiO_2, with a significant fraction of organic material. Analysis of the bias and sweep rate dependence of the devices suggested the switching mechanism was induced by charge flow in the memristor and not by the electric field. Further analysis of the I-V curves indicated that once the memristors were switched into the high-current "ON" state, conduction through them generally became ohmic. Once such memristors were cut to yield two smaller devices, there was typically only one device that remained ohmic, indicating that localized conduction pathways caused switching in the flexible memristors. There was a shift in the capacitance-frequency and conductance-frequency measurements following switches between the "ON" and "OFF" states of the devices, indicating that an additional dielectric loss mechanism was present in these films that was not present in ordinary TiO_2 films. This loss mechanism is attributed to dipoles in the organic constituents of the films that are by-products of the sol-gel process.

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