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Resistive switching in highly disordered thin oxide films

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In thin films of mixed ionic electronic conductors sandwiched by two ion-blocking electrodes, the homogeneous migration of ions and their polarization will modify the electronic carrier distribution across the conductor, thereby enabling homogeneous resistive switching. Here we report non-filamentary memristive switching based on the bulk oxide ion conductivity of amorphous GaOx (x~1.1) thin films. We directly observe reversible enrichment and depletion of oxygen ions at the blocking electrodes responding to the bias polarity by using photoemission and transmission electron microscopies, proving that oxygen ion mobility causes memristive behavior. The shape of the Hysteresis I-V curves are tunable by the bias history, as found in the mathematically derived memristor model. This dynamical behavior can be attributed to the coupled ion drift and diffusion motion and the oxygen concentration profile acting as a state function of the memristor. Further examples will be discussed.

Biography

Manfred Martin is Professor and Head of the Institute of Physical Chemistry of RWTH Aachen University, Germany. At Seoul National University, Korea he was WCU Professor and is now Adjunct Professor. He has more than 30 years of experience in education and research of physical chemistry of solids as well as service at department, faculty and university level. His current research focusses on materials for energy conversion, resistive switching, solid-state reactions, secondary ion mass spectrometry, and computer simulations as well. Professor Manfred Martin has published >200 scientific papers in international, refereed journals. He received the Carl-Wagner Award and has been elected as member of the Royal Society of Chemistry. He has supervised more than 50 Ph.D. students and more than 20 postdoctoral fellows.

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