RESISTIVE SWITCHING IN HIGHLY DISORDERED THIN OXIDE FILMS

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Ionic and electronic transport in functional oxide materials is of great relevance for applications in the fields of energy and data storage, e.g. solid oxide fuel cells (oxygen ion conductivity), oxygen permeation membranes (ambipolar diffusion of oxygen), or data storage materials (electronic and/or ionic conductivity). In this contribution, our recent work on highly non-stoichiometric, amorphous thin film oxides will be discussed.
In amorphous solids structural disorder can lead to an insulator–metal transition due to Anderson localization, i.e. the electronic states below the mobility edge are localized. If the Fermi energy passes through the mobility edge, the material changes from an electronic insulator to a metal. In addition, large deviations from the ideal stoichiometry of an oxide, that is, high defect concentrations, provide a high concentration of electronic defects (self-doping). We will consider examples of highly disordered oxides that were prepared by pulsed laser deposition and sputtering as well and discuss their electronic conductivities and their application in resistive memory devices.