Memristive materials and devices – A new frontier

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Memristive materials have unique nonlinear current-voltage characteristics. In their simplest form, they have a high-resistance and a low-resistance state and can be used as simple, two-terminal non-volatile memory devices with a potential to replace the current technology oxides [3]. Finally, novel memristive behavior in ZnO_2 nanowire bundles will be demonstrated [4] in next-generation memory sticks. The nonlinearity is typically achieved by motion of defects, e.g., vacancies, by applying a SET and a RESET voltage. This talk will describe a multiscale theory based on density-functional quantum-mechanical calculations and Monte-Carlo simulations to account for observations in vacancy-motion-based memristors [1]. In conjunction with experimental data, it is demonstrated that grain boundaries can act as nanovaristors [2]. Experimental data and a theory will be used to demonstrate an alternative type of memristor based on interfacial magnetoelectricity in complex oxides [3]. Finally, a novel type of memristive system based on bundles of ZnO2 nanorods will be demonstrated [4].

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Short CV

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