Materials Science-2013

OMICS Group Conferences
Accelerating Scientific Discovery

2nd International Conference and Exhibition on
Materials Science & Engineering

October 7-9, 2013 Hampton Inn Tropicana, Las Vegas, USA

Interface engineering of CeO_2 nanostructure based memristors

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Abstract

We report a novel approach to improve the resistive switching performance of metal oxide based memristors. In the first approach, the vertically aligned ZnO (NR) arrays were grown on transparent conductive glass by electrochemical deposition while CeO_2 quantum dots (QDs) were prepared by a solvothermal method. Subsequently, the as-prepared CeO_2 QDs were embedded into ZnO NRs array by dip-coating to obtain CeO_2-ZnO nano-composite. Interestingly, such a device exhibits excellent resistive switching properties with much higher ON/OFF ratios, better uniformity and stability over the pure ZnO and CeO_2 nanostructures. The origin of resistive switching was studied and the role of hetero-interface was discussed. Secondly, self-assembled CeO_2 nanocubes based resistive switching device was fabricated by hydrothermal process. The device was proven to exhibit excellent resistive switching performance. The origin of switching behaviour on the basis of filament model and inter cube junctions was presented. The present devices demonstrate to have the potential for next generation non-volatile memory applications.

Biography

Mr Adnan Younis received his M.Phil in Physics from Quaid-i-Azam University Islamabad-Pakistan in 2009, where he researched high temperature superconductors in the Material Science laboratory of Dr. Nawazish Ali Khan. He is currently a PhD candidate with Prof. Sean Li and Dr. Dewei Chu in the laboratory of advanced multifunctional and energy materials at school of Material Science and Engineering, University of New South Wales Australia. His research interests involve development of metal oxides with their applications in next generation non-volatile memory devices such as resistive random access memories (RRAM).