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Dilute electrodeposition of TiO_2 and ZnO thin film memristors on Cu substrate (Conference Paper) (Open Access)

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Abstract

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Memristor has become one of the alternatives to replace the current memory technologies. Fabrication of titanium dioxide, TiO_2 memristor has been extensively studied by using various deposition methods. However, recently more researches have been done to explore the compatibility of other transition metal oxide, TMO such as zinc oxide, ZnO to be used as the active layer of the memristor. This paper highlights the simple and easy-control electrodeposition to deposit titanium, Ti and zinc, Zn thin film at room temperature and subsequent thermal oxidation at 600 °C. Gold, Au was then sputtered as top electrode to create metal-insulator-metal, MIM sandwich of Au/TiO_2-Cu_2O-CuO/Cu and Au/ZnO-Cu_2O-CuO/Cu memristors. The structural, morphological and memristive properties were characterized using Field Emission Scanning Electron Microscopy, FESEM, X-Ray Diffraction, XRD and current-voltage, I-V measurement. Both Au/TiO_2-Cu_2O-CuO/Cu and Au/ZnO-Cu_{2O}-CuO/Cu memristivity were identified by the pinched hysteresis loop with resistive ratio of 1.2 and 1.08 respectively. Empirical study on diffusivity of Ti^{4+}, Zn^{2+} and O^{2-} ions in both metal oxides show that the metal vacancies were formed, thus giving rise to its memristivity. The electrodeposited Au/TiO_2-Cu_2O-CuO/Cu and Au/ZnO-Cu_2O-CuO/Cu memristors demonstrate comparable performances to previous studies using other methods. © Published under licence by IOP Publishing Ltd.

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