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Switching Characteristics in TiO₂/ZnO Double Layer Resistive Switching Memory Device

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Abstract- The uniform and reliable resistive switching characteristics of the ZnO based RRAM device with thin TiO₂ layer are successfully investigated. In this study, the effect of thickness of TiO₂ layer on switching characteristics has been investigated. Compared with different thicknesses of thin TiO₂ layer, the remarkable improved resistive switching parameters such as lower forming voltage and the narrower variation of endurance are achieved for TiO₂ layer of thickness 2 nm. The forming voltages are dependent on the TiO₂ thickness which supports the idea that forming process is governed by dielectric breakdown like phenomenon. The Ti/TiO₂/ZnO/Pt device with the 2 nm TiO₂ layer exhibits good DC endurance up to 10³ cycles. The non-volatility of data storage is further confirmed by retention test measured at room temperature. It has been observed that both low resistance state (LRS) and high resistance state (HRS) do not exhibit any degradation for more than 10⁴ s.

Keywords: Resistive Switching, ZnO thin film, TiO₂, double layer, RRAM, memory device