Neuromorphic Memristors with TiO_2 and a-IGZO Bilayer Structure

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In recent years, ReRAM devices have gained significant attention in neuromorphic applications and hardware-based artificial intelligence [1–2]. Specifically, the resistive memory devices exhibit ultrafast read and write speeds, high retention time [3], low voltage operation and low power consumption, emerging an attractive research target from the perspective of the modern low-cost portable devices [4].

Our proposed device performance and physical properties of the fabricated ReRAM devices were assessed at various annealing temperatures. The analysis from XPS results confirms that the device operation was mostly driven by the density of oxygen vacancies in the TiO_2 and a-IGZO bilayer structure. The optimal density of oxygen vacancies in the a-IGZO causes the drift of O^{2-} ions to and from the TiO_2 layer that induced a significant variation in the resistivity of the device, providing switching behavior.

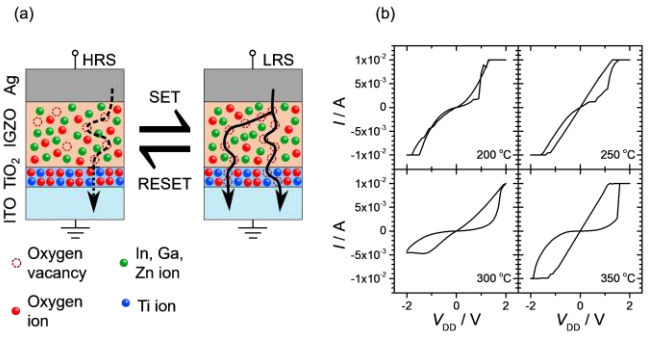

Figure 1(a) Schematic illustration of the mechanism of the conduction in the HRS and LRS (b) schematic drawing of the TiO_2 -IGZO ReRAM device with the I-V characteristics.

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