

Influence of Tungsten Doping on the Performance of InZnO Memristors

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ABSTRACT

The characteristics of conductive-bridging random access memory (CBRAM) with amorphous indium-tungsten-zinc-oxide (α -InWZnO) switching layer and copper (Cu) ion- supply layer were prepared by sputtering. It was found that the doping ratio of tungsten has a significant effect on the memory characteristics of the CBRAM, and the doping of tungsten acts as a suppressor of oxygen vacancies in the InWZnO film. The O1s binding energy associated with the oxygen-deficient regions in the α -InWZnO thin film decreases with increasing tungsten doping ratio, which can be demonstrated by X-ray photoelectron spectroscopy. When the tungsten doping ratio is 15%, the α -InWZnO CBRAM can achieve the excellent memory characteristics, such as high switching endurance (up to 9.7×10^3 cycling endurance), low operating voltage, and good retention capability. Moreover, the electrical uniformity and switching behavior of InWZnO device are evidently improved as the doping ratio of tungsten in the switching layer increases. These results suggest that CBRAM based on novel material InWZnO have great potential to be used in high-performance memory devices.