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The effects of oxygen plasma implantation on bipolar resistive-switching properties of copper nitride thin films

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Abstract: Copper nitride (Cu_xN) thin films were prepared by plasma ion immersion implantation (PIII) then post-processed with oxygen plasma implantation at a voltage of -1.5 kV. The resistive-switching properties of the Cu_xN:O-based RRAM devices were studied with different oxygen implantation time from 0 to 20 minutes. The memory cells processed with oxygen plasma implantation for 5 minutes showed longest endurance performances, largest resistance window and highest yield. Linear fitting results of the electrical measurements indicated the formation of copper oxide (CuO) is benefit for prolonged cycle life of the Cu_xN based RRAM devices, while increasing Cu_2O species will lead to severe performance degradation.

Key words: copper nitride, resistive switching (RS), oxygen plasma, plasma ion immersion implantation (PIII).