

Accepted Manuscript

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PII: S0040-6090(17)30052-4
DOI: doi: [10.1016/j.tsf.2017.01.042](https://doi.org/10.1016/j.tsf.2017.01.042)
Reference: TSF 35754

To appear in: *Thin Solid Films*

Received date: 30 June 2016
Revised date: 29 November 2016
Accepted date: 21 January 2017

Please cite this article as: Xiaoqin Du, Qianfei Zhou, Zhong Yan, Yongning Zhou, Xiaojing Wu , The effects of oxygen plasma implantation on bipolar resistive-switching properties of copper nitride thin films. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Tsf(2017), doi: [10.1016/j.tsf.2017.01.042](https://doi.org/10.1016/j.tsf.2017.01.042)

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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 $\text{Cu}_x\text{N}:\text{O}$ -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).

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