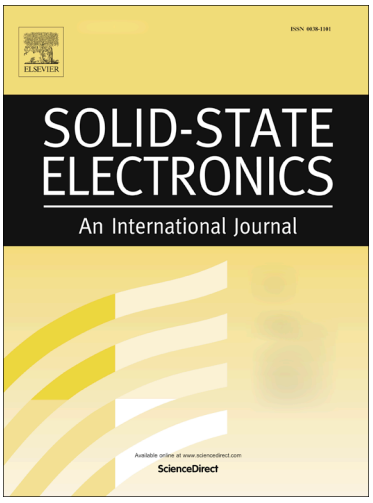

Enlarged memory margins for resistive switching devices based on polyurethane film due to embedded Ag nanoparticles

Lu Liu, Kailei Lu, Dong Yan, Jiazhen Zhang, Chi Ma, Zhengqiang Jia, Wen Wang, Enming Zhao

PII: S0038-1101(18)30094-7
DOI: https://doi.org/10.1016/j.sse.2018.06.003
Reference: SSE 7441

To appear in: *Solid-State Electronics*

Received Date: 2 February 2018
Revised Date: 20 April 2018
Accepted Date: 5 June 2018

Please cite this article as: Liu, L., Lu, K., Yan, D., Zhang, J., Ma, C., Jia, Z., Wang, W., Zhao, E., Enlarged memory margins for resistive switching devices based on polyurethane film due to embedded Ag nanoparticles, *Solid-State Electronics* (2018), doi: https://doi.org/10.1016/j.sse.2018.06.003

Enlarged memory margins for resistive switching devices based on polyurethane film due to embedded Ag nanoparticles

Lu Liu, Kailei Lu, Dong Yan, Jiazhen Zhang, Chi Ma, Zhengqiang Jia, Wen Wang, Enming Zhao*
Key Lab of In-fiber Integrated Optics, Ministry Education of China, Harbin Engineering University, Harbin 150001, People's Republic of China

ABSTRACT: Current-voltage (*I-V*) properties of indium-tin-oxide/Ag nanoparticles embedded in polyurethane film/Al devices exhibited a current bistability with ON/OFF ratio within the range of 10^5~10^3 with the variation of voltage from -0.85 to 3.95 V, which was nearly 10^2 larger than that for the device without Ag nanoparticles. The memory margin was obviously enlarged due to the existence of the Ag nanoparticles embedded in the polyurethane layer. *I-V* properties and write-read-erase-read voltage cycles test indicated the flash resistive switching properties. The data retention time reach up to 1.8×10^4 s, which manifested the stability of the memory devices. *I-V* property at ON state was attributed to the drift mechanism, and the property at OFF state was related to the space-charge-limited-current behaviors.

KEYWORDS: polyurethane, Ag nanoparticles, resistive switching, flash

1. Introduction

Nonvolatile memory devices fabricated used hybrid inorganic/organic composites containing inorganic nanoparticles are currently attracting a great deal of interest on account of their potential applications in nonvolatile memory devices because of their excellent advantages of low-power consumption, high-density storage, favourable-mechanical flexibility, low cost, and simple fabrication [1-4]. Especially there have been significant efforts centered on developing flash resistive switching memory [5-6], which could surmount and surpass the advantages of hard-disk drives. To this day, different kinds of active materials, like small molecules, polymers, and hybrid organic/inorganic nanocomposites, have been widely studied in electrically bistable devices [7-13]. In the kind of memory devices based on organic/inorganic nanocomposites, the electrical bistability is mainly due to the inorganic nanoparticles[14-15]. One of high-profile composites was the polymer-metal nanoparticle system [16-18], which electrical bistability was detected. Such polymer-metal nanoparticle system have draw attention and have been widely applied in a great many fields, owing to their electrical properties could be tailored by changing the compositions. Ouyang et al. [19] researched the resistive switching characteristics by using Au nanoparticles