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Bipolar Resistive Switching in Si/Ag Nanostructures

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Abstract

Resistive switching devices are being intensively studied aiming a large number of promising applications such as nonvolatile memories, artificial neural networks and sensors. Here, we show nanoscale bipolar resistive switching in Pt/Si/Ag/TiW structures, with a dielectric barrier thickness of 20 nm. The observed phenomenon is based on the formation/rupture of metallic Ag filaments in the otherwise insulating Si host material. No electroforming process was required to achieve resistive switching. We obtained average values of 0.23 V and -0.24 V for the Set and Reset voltages, respectively. The stability of the switching was observed for over 100 cycles, together with a clear separation of the ON ($10^3 \Omega$) and OFF ($10^2 \Omega$) states. Furthermore, the influence of the Set current compliance on the ON resistance, resistances ratio and Set/Reset voltages percentage variation was also studied.

1. Introduction

Present computer processing capabilities are becoming a restriction to meet modern technological needs. Therefore, approaches beyond the von Neumann architecture are imperative and the brain's operation and structure are truly

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