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Graphene Oxide Thin Films for Nonvolatile Memory Applications

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There has been strong demand for novel nonvolatile memory technology for low-cost, large-area, and low-power flexible electronics applications. Resistive memories based on metal oxide thin films have been extensively studied for application as next-generation nonvolatile memory devices. However, although the metal oxide-based resistive memories have several advantages, such as good scalability, low-power consumption, and fast switching speed, their application to large-area flexible substrates has been limited due to their material characteristics and necessity of a high-temperature fabrication process. As a promising nonvolatile memory technology for large-area flexible applications, we present a graphene oxide-based memory that can be easily fabricated using a room temperature spin-casting method on flexible substrates and has reliable memory performance in terms of retention and endurance. The microscopic origin of the bipolar resistive switching behaviour was elucidated and is attributed to rupture and formation of conducting filaments at the top amorphous interface layer formed between the graphene oxide film and the top Al metal electrode, via high-resolution transmission electron microscopy and in situ x-ray photoemission spectroscopy. This work provides an important step for developing understanding of the fundamental physics of bipolar resistive switching in graphene oxide films, for the application to future flexible electronics.

[1] Hu Young Jeong, Jong Yun Kim, Jeong Won Kim, Jin Ok Hwang, Ji Eun Kim, Jeong Yong Lee, Tae Hyun Yoon, Byung Jin Cho, Sang Ouk Kim, Rodney S. Ruoff, and Sung-Yool Choi, Nano Letters, 10, 4381 (2010)

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