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Improved performance of graphene oxide based resistive memory devices through hydrogen plasma

P. Justin Jesuraj[#], R. Parameshwari[#], K. Jeganathan*

Centre for Nanoscience and Nanotechnology,
School of Physics, Bharathidasan University,
Tiruchirappalli – 620 024, Tamil Nadu, India.

* Corresponding author

E-Mail: kjeganathan@yahoo.com

# These authors equally contributed to this work.

Abstract

We report the improved performance of graphene oxide (GO) based resistive random-access memory devices (ReRAM) through mild hydrogen plasma treatment. The threshold voltage of the ReRAM device is successfully reduced from 2.6 to 1.8 V together with an enhanced ON/OFF ratio of 10^3 with the help of hydrogen plasma treated GO (HGO). Significantly, the rise of a weak 2D band in Raman spectrum of HGO reveals the mild reduction of GO by H_2 plasma. The concurrent removal of oxygen moieties on basal plane and on edges of graphitic network in GO by the virtue of H_2 plasma contributing enhanced performance in ReRAM devices. The significant diminution of oxygen moieties on GO lattice in HGO infused device reduces the insulating barrier formed at Al/GO interface which reinforced the electron transport. The effective selection of plasma treatment is found to be one of the proficient routes to enhance the storage capabilities of GO based resistive memory devices.

Keywords: Carbon materials; Interfaces; electrical properties; Raman

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