

## Fabrication of Reduced Graphene Oxide Membranes for Water Remediation

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Reduced graphene oxide (rGO) has a huge potential for membrane applications owing to its appropriate interlayer spacing (0.34–0.37 nm), which enables it to block salt ions as small as Na<sup>+</sup> with high precision. However, fabrication of uniform rGO membranes is a great challenge because of the loss of its polar functional groups during preparation from graphene oxide (GO). Although there have been several studies on GO membranes and a few on rGO for water purification, very few attempts to understand the role of oxygen-containing functional groups in successful membrane formation.

The present work deals with the investigation of the key factors and functional groups that govern membrane formation. This work also utilizes the facile approach of synthesizing reduced GO by environmentally viable hydro-thermal reduction. GO samples reduced at 160°C for 30 min up to 10 h were investigated. The surface morphology of the uniform (treated for 1 h) and nonuniform membranes (treated for 8 h) are shown in Fig. 1 (a) and (b), respectively. Further characterizations show that the hydroxyl/carboxylic groups are principally responsible for the formation of free standing rGO membranes due to the possibility of hydrogen bridging, as schematically illustrated in Fig. 1 (b)(d). Salt ion permeation of rGO membranes treated under 30 min, 1 h, 2 h were studied. This report not only reveals informative insights on rGO membrane formation but also projects a myriad of uses for the prepared materials in water separation applications.

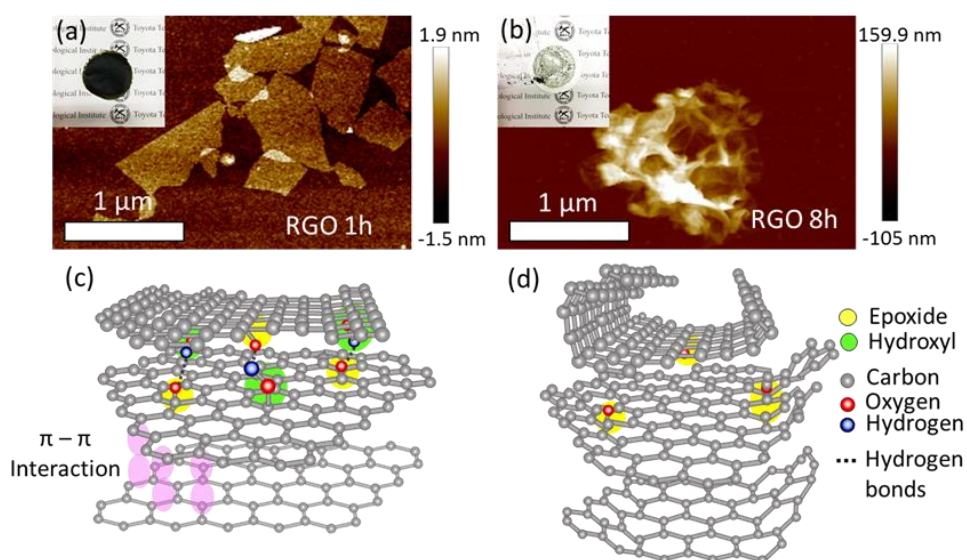


Figure 1. Atomic force microscopic images of (a) RGO treated for 1 h and (b) 8 h. (c) and (d) are the corresponding schematics showing the configuration of rGO membrane.

[1] R. R. Nair et al., Science 335, 442 (2012). [2] R. K. Joshi et al., Science 343, 752 (2014).