

Synthesis and exfoliation of graphene-based materials for sensing and energy storage

Presenting Author: **A.G. Kamaha Tchekep**^{1, 2}

Co-Authors: V. Suryanarayanan^{1,2}; Deepak K. Pattanayak^{1,2*}

¹CSIR-Central Electrochemical Research Institute, Karaikudi, 630003, Tamil Nadu, India.

²Academy of Scientific and Innovative Research (AcSIR), Ghaziabad- 201002, India.

E-mails: kamaha.cecric21a@acsir.res.in; vsurya.cecric@csir.res.in; deepakp.cecric@csir.res.in

Abstract

Graphene, a single layer of carbon atoms arranged in a two-dimensional honeycomb lattice, possesses exceptional mechanical, thermal and electron transport properties that give it a wide range of applications [1,2]. However, its high production cost and processing challenges have driven extensive research into cost-effective alternatives such as graphene oxide (GO) [3,4] and reduced graphene oxide (rGO) [5,6]. Herein, efficient synthesis and exfoliation methods for GO and the hybrid material, reduced graphene oxide@graphene oxide (rGO@GO) are proposed. Their successful synthesis and exfoliation, as well as their layered structure were confirmed by advanced characterization techniques such as XRD, Raman spectroscopy, XPS, FE-SEM and HR-TEM. Various electrochemical studies, revealed their great capacities to act as recognition elements, charge storage materials, catalyst support and hence, their strong potential for the development of sensors and Energy storage devices.

References

- [1] Galvagno et al., *Advanced Functional Materials*, 34 (2024) 2313043.
- [2] Jiajie Liang et al., *Advanced Functional Materials*, 21(2011) 3778–3784.
- [3] Marcano, Daniela C., et al., *ACS NANO*, 4.8 (2010) 4806-4814.
- [4] Domga et al., *Electrochimica Acta*, 341 (2020) 135999.
- [5] Hon Nhien Le et al., *RSC Advances*, 14 (2024) 30844–30858.
- [6] M.P. Lavin-Lopez et al., *Advanced Powder Technology*, 28 (2017) 3195–3203.

Figures

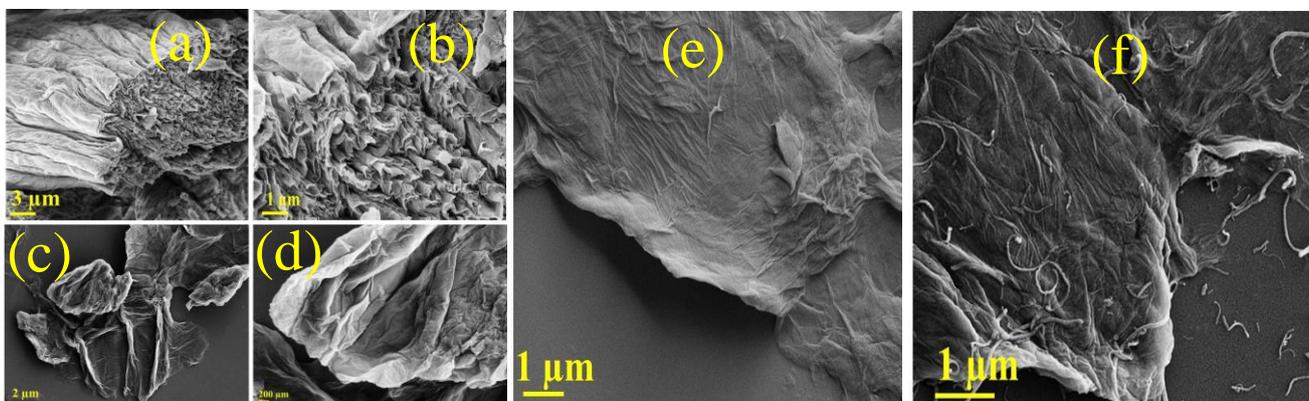


Figure 1: (a and b) As synthesized GO, (c and d) exfoliated GO, (e) single layer GO (SLGO), (f) SLGO supported multiwalled carbon nanotube (MWCNTs) for sensing applications.

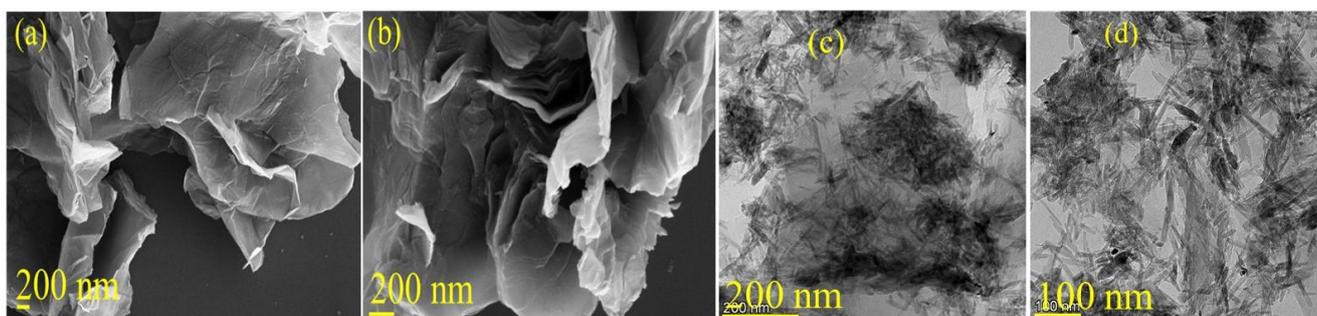


Figure 2: (a and b) As synthesized reduced graphene oxide@graphene oxide hybrid material (rGO@GO), (c and d) rGO@GO supported manganese oxide nanorods for energy storage application.