

Graphene-Based Surface Heating for De-icing Applications

Nazmul Karim,^{1*} Minglonghai Zhang,² Shaila Afroj,^{1,3} Vivek Koncherry,^{2,4} Prasad Potluri,^{2,4} and Kostya S Novoselov^{1,3}

¹The National Graphene Institute (NGI), The University of Manchester, Booth Street East, Manchester, M13 9PL, UK

²School of Materials, The University of Manchester, Oxford Road, Manchester, M13 9PL, UK

³School of Physics & Astronomy, The University of Manchester, Oxford Road, Manchester, M13 9PL, UK

⁴The Northwest Composites Centre, The University of Manchester, Oxford Road, Manchester, M13 9PL, UK

*Corresponding author E-mail: mdnazmul.karim@manchester.ac.uk;

Keywords: graphene ink, de-icing composites, glass fibre, joule heating and smart composites

Supporting Information:

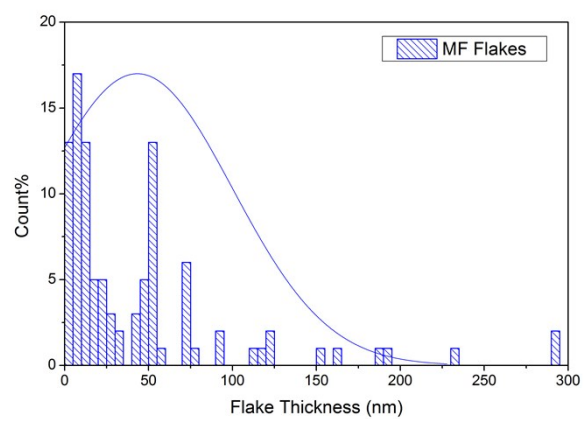


Figure S1. Flake thickness distribution of MF flakes

Supporting Information: High Resolution XPS spectra of Graphite and MF Flakes

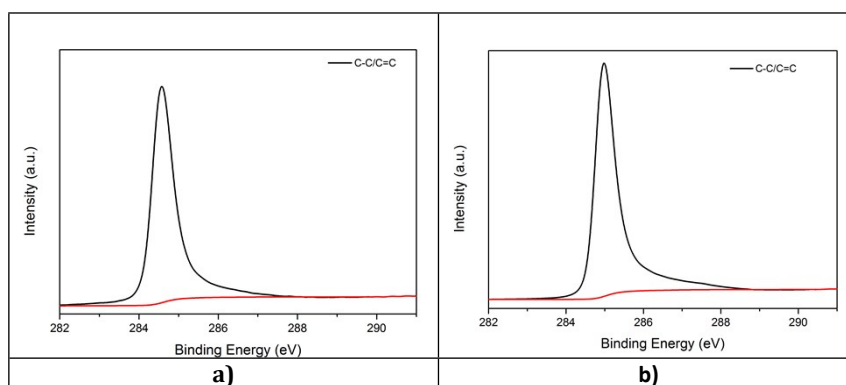


Figure S2. High resolution C (1s) XPS spectrum of a) starting graphite and b) MF flakes

Supporting Information: Joule Heating of Graphene-Based Glass Roving

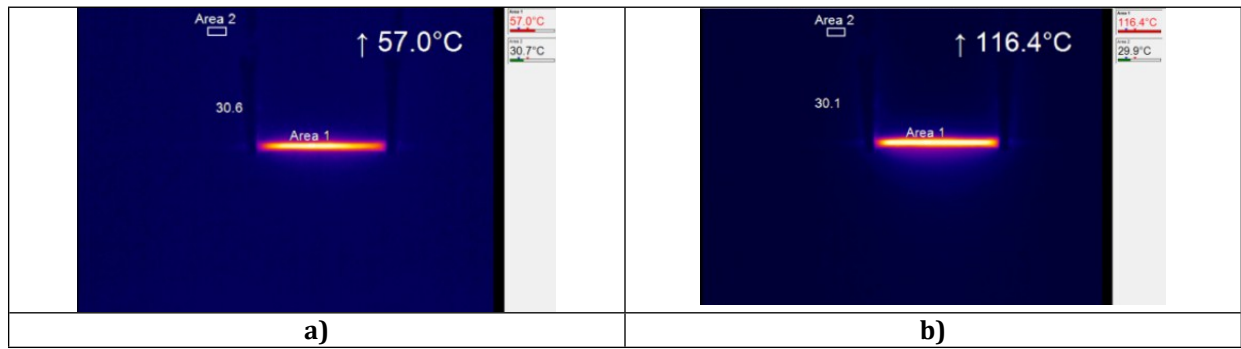


Figure S3. Thermal images of graphene-based glass rovings a) 3 V and b) 6V

Supporting Information: Graphene-Based Glass-fibre Composite

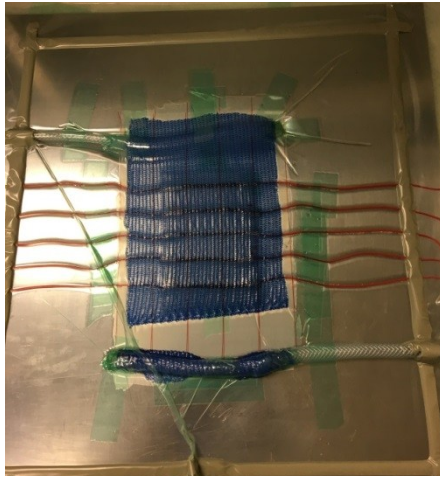


Figure S4. a) Vacuum resin infusion for making composites and b) Graphene-based glass-fibre composite for de-icing application