Polyurethane Sponge Facilitating Highly Dispersed TiO$_2$ Nanoparticles on Reduced Graphene Oxide Sheets for Enhanced Photoelectro-Oxidation of Ethanol

*Lin Jing,[a,b] Hui Ling Tan,[b] Rose Amal,[b] Yun Hau Ng, [*b] and Ke-Ning Sun[*a]*

a. Beijing Key Laboratory for Chemical Power Source and Green Catalysis,School of Chemical Engineering and Environment,Beijing Institute of Technology, Beijing 100081, People's Republic of China

b. Particles and Catalysis Research Group, School of Chemical Engineering, The University of New South Wales, Sydney NSW 2052, Australia

Corresponding Author

Prof. Ke-Ning Sun: Email: bitkeningsun@163.com;

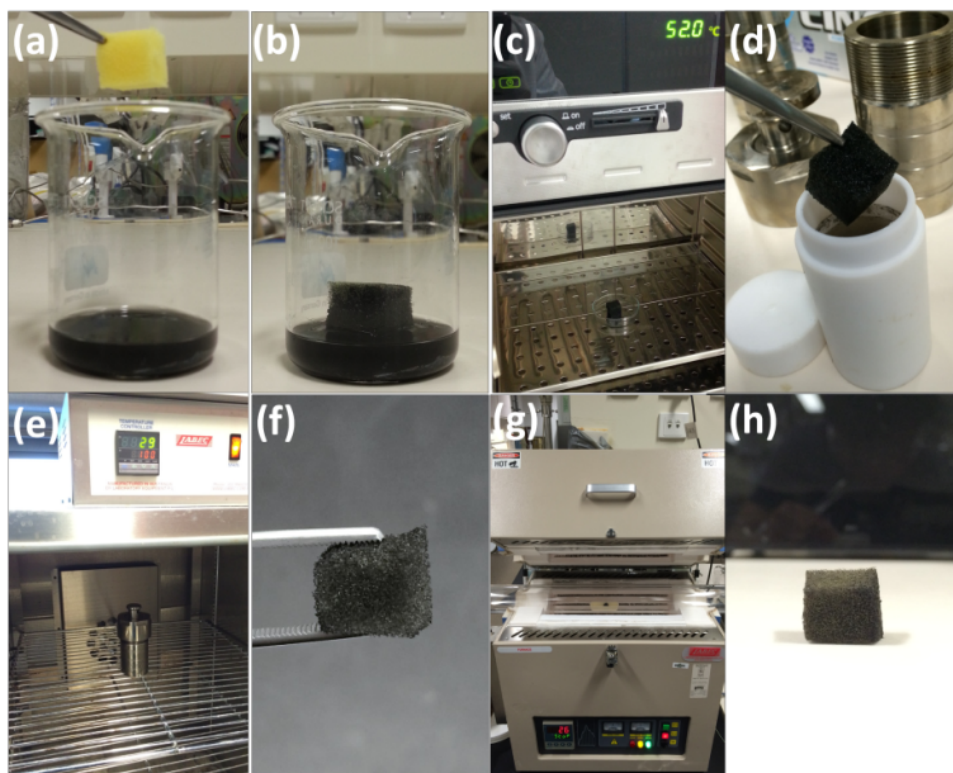Dr. Yun Hau Ng: E-mail: yh.ng@unsw.edu.au

Fig. S1 (a-b) Adsorption of GO into the bare sponge template to prepare GO-sponge. (c) Drying process for ethanol removal. (d-f) Hydrothermal treatment process for growth of TiO_2 and the as-obtained GO-TiO_2-sponge. (g-h) Annealing process of GO-TiO_2-sponge to produce S-RGO-TiO_2.
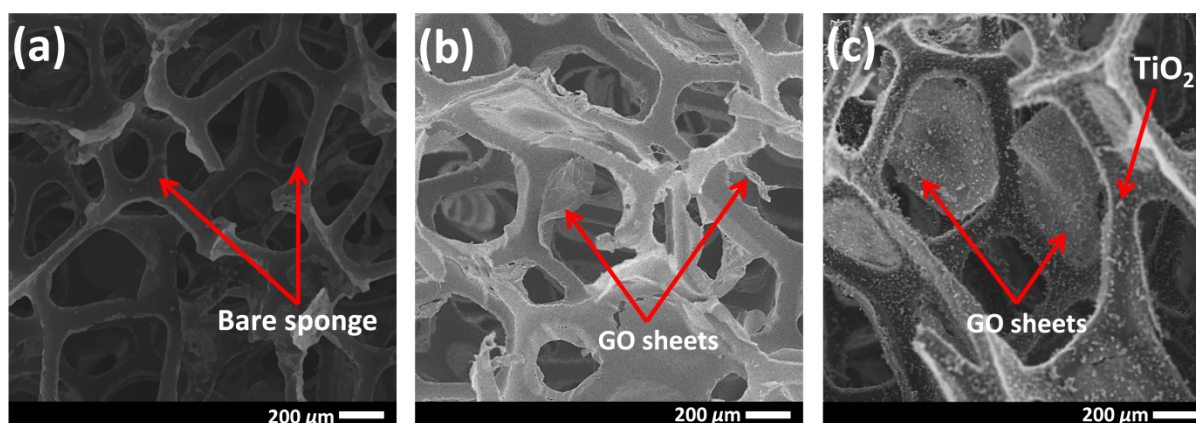

Fig. S2 SEM of (a) bare polyurethane sponge, (b) GO-sponge and (c) GO-TiO_2-sponge before annealing treatment for polyurethane sponge removal.
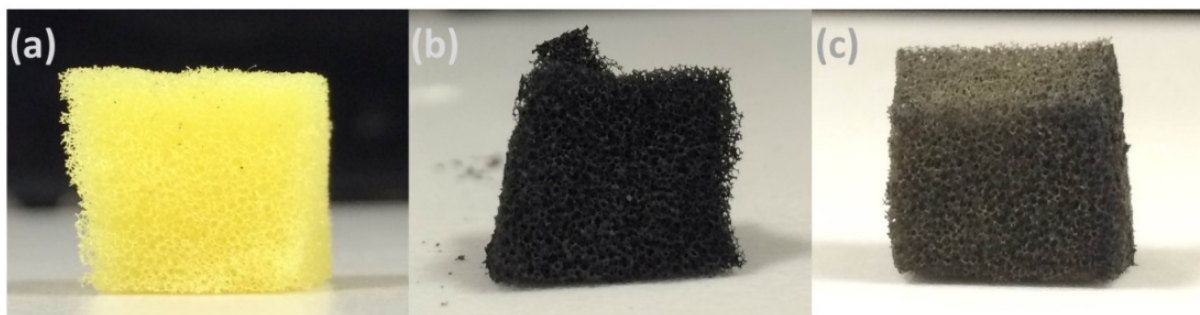
Fig. S3 Photos of (a) bare polyurethane sponge, (b) S-RGO and (c) S-RGO-TiO$_2$. S-RGO and S-RGO-TiO$_2$ obtained after annealing at 450 ℃ in the mixture of argon/hydrogen for 2 h.
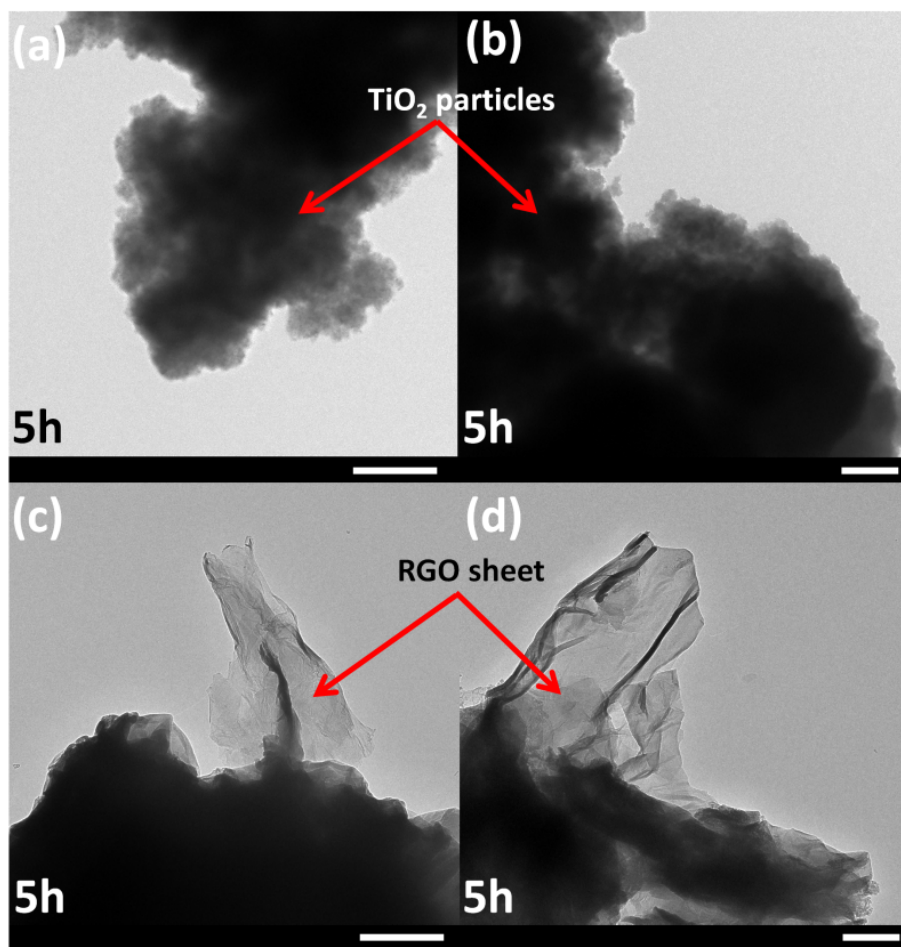

Fig. S4 TEM images of (a)(b) bare TiO$_2$ and (c)(d) RGO-TiO$_2$. Both bare TiO$_2$ and RGO-TiO$_2$ were obtained after 5h hydrothermal treatment and 2h annealing treatment. Scale bar: 200 nm.
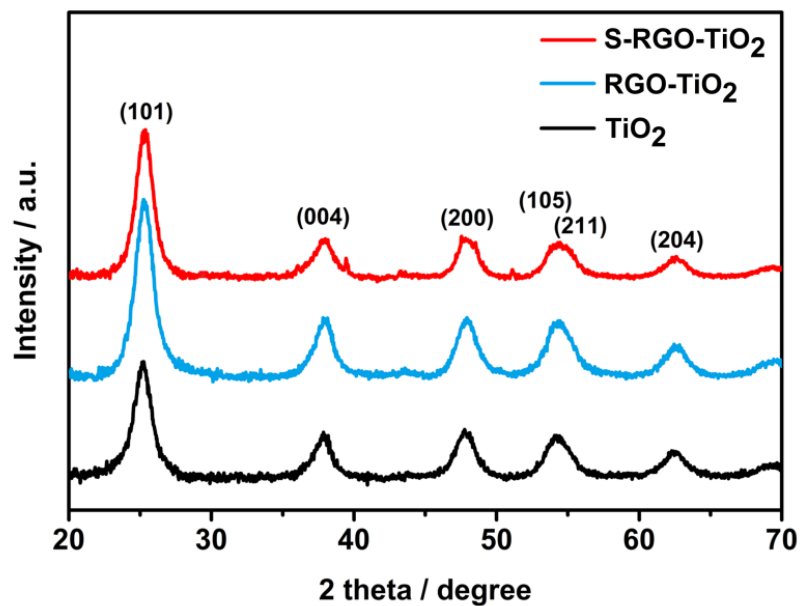
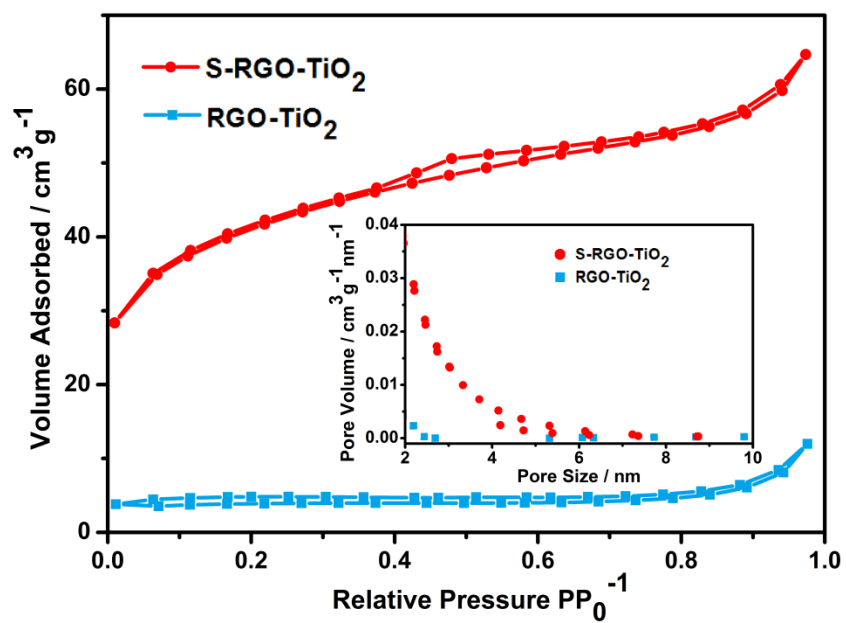**Fig. S5** XRD of TiO_2, $RGO-TiO_2$ and $S-RGO-TiO_2$.

Fig. S6 Nitrogen adsorption-desorption isotherm of $RGO-TiO_2$ and $S-GRO-TiO_2$. The insert shows their pore-size distributions.
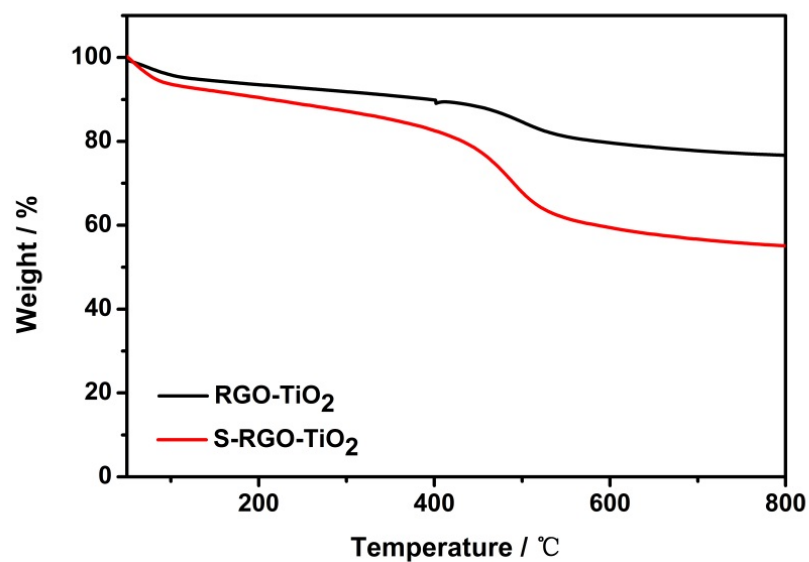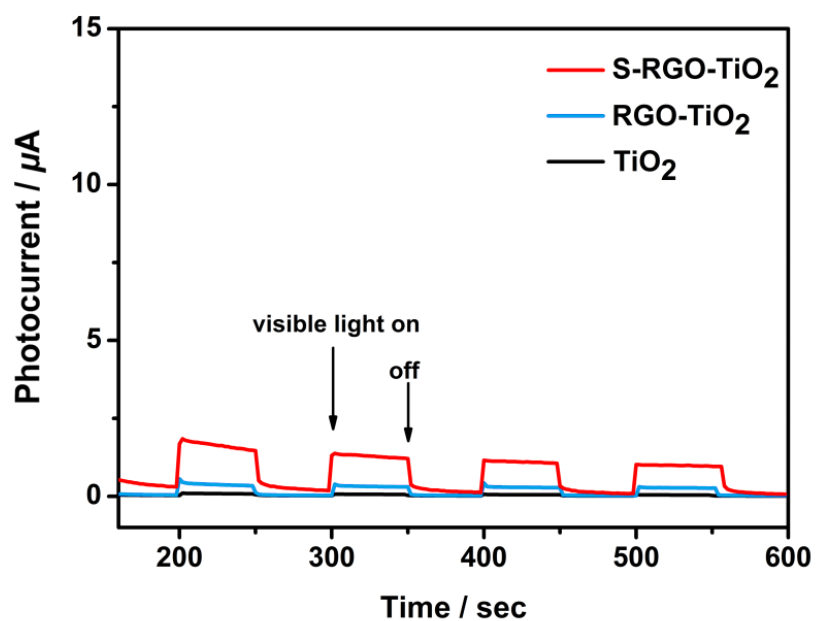
Fig. S7 TGA of RGO-TiO$_2$ and S-RGO-TiO$_2$.

Fig. S8 The photocurrent responses of TiO$_2$, RGO-TiO$_2$, and S-RGO-TiO$_2$ for each switch-on/off event with a bias voltage of 0.25 V in 0.5 M Na$_2$SO$_4$ and 0.1 M ethanol electrolyte solution under visible light irradiation.