Electronic Supplementary Information (ESI)

Enhanced Electrocatalytic Performance of Graphene Counter Electrode *via* Incorporation of SiO_2 Nanoparticles for Dye-Sensitized Solar Cells

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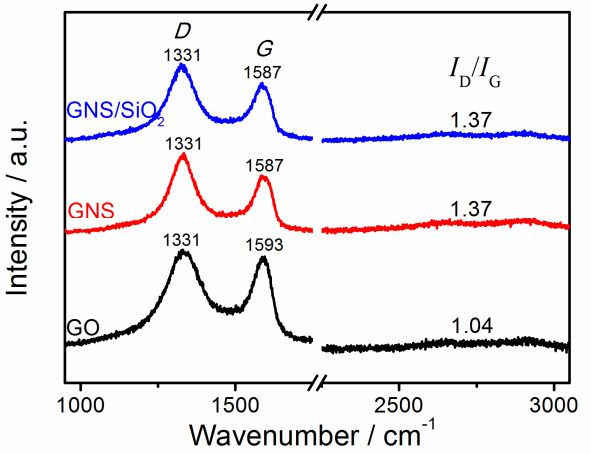

Fig. S1 Raman spectra for GO, GNS and GNS/SiO_2 products

Fig. S1 depicts the typical Raman spectra of GO, GNS and GNS/SiO_2. The spectrum for GO shows two prominent bands located at 1593 cm^{-1} (G band) and 1331 cm^{-1} (D band), which are usually assigned to zone center phonons of E_{2g} symmetry and *K*-point phonons of A_{1g} symmetry, respectively.[1] Thus, the intensity ratio of the D and G band (I_D/I_G) is usually taken as an indication of the relative disorder present in graphitic structures. The spectrum for GNS displays G and D bands at 1587 and 1331 cm^{-1}, respectively. The G band shifts from 1593 to 1587 cm^{-1}, which confirms the reduction of GO to GNS during the chemical treatment.[2] Furthermore, the I_D/I_G varies from 1.04 for GO to 1.37 for GNS. This change suggests a decrease in the average size of the sp^2 domains upon reduction of the exfoliated GO.[3] For the GNS/SiO_2 composite, the position and intensity of D band and G band have scarcely changed upon incorporation of SiO_2, indicating a physical adsorption mode on GNS. It has

been reported that silica, when noncovalently attached to carbon nanotubes, did not influence the band position and intensity ratio of D band to G band.[4]

References

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