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Fabrication of reduced graphene oxide/metal (Cu, Ni, Co) nanoparticle hybrid composites via a facile thermal reduction method

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Experimental Procedures

Synthesis
Graphene oxide was prepared according to the Hummers’ method in our previous report.[1] Quantitative amount of resulted graphene oxide was dissolved in 80 mL of deionized water by ultrasound, then metal nitrate (Cu(NO$_3$)$_2$·2.5H$_2$O, Ni(NO$_3$)$_2$·6H$_2$O, Co(NO$_3$)$_2$·6H$_2$O) with certain amount was added into the above GO solution. After stirring for 18 hours, 1 M NaOH solution was dropped into the beaker for adjusting the pH to 11. After further stirring for 2 hours, the suspension was centrifugated and washed with deionized water for several times, and the resulted gunk was dried at 60 °C in the oven before calcined at 500 °C for 90 min under flowing Ar. The resulted composites were referred to rGO/Cu-x-y, rGO/Ni-x-y, or rGO/CoO-x-y, in which x-y is the mass ratio of GO to metal nitrate precursors.

Characterization
Structures of all samples were characterized by X-ray powder diffraction (XRD) on a PANalytical Empyrean Reflection Diffractometer with Cu Ka irradiation (λ = 0.15418 nm). HRTEM images and TEM elemental mapping of samples were observed on a JEOL JSM-2011 Transmission Electron Microscopy (TEM) with an acceleration voltage of 200 kV. The morphologies of all samples were observed on a JEOL JSM-6700 Field Scanning Electron Microscopy (FESEM). The surface group change in the as-prepared samples were identified by Fourier transform infrared spectroscopy (FT-IR) on IRAffinity-1S (SHIMADZU, Japan) with powder samples.

References