Supporting Information

One-Pot Synthesis of CoFe$_2$O$_4$/Graphene Oxide Hybrids and Their Conversion into FeCo/Graphene Hybrids for Lightweight and High Efficient Microwave Absorber

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Figure S1 EDX spectra of (a) CoFe$_2$O$_4$/GO and (b) FeCo/graphene hybrids
Figure S2 AFM image of GO
Figure S3 Frequency dependence of (a) magnetic loss tangent and (b) dielectric loss tangent of pure CoFe\textsubscript{2}O\textsubscript{4} nanocrystals, CoFe\textsubscript{2}O\textsubscript{4}/GO and FeCo/graphene hybrids
We have measured the conductivity by four-point probe technique, a standard programmable DC voltage/current detector. Both the CoFe$_2$O$_4$/GO and FeCo/GNs hybrids were pressed into toroidal shape with outer diameter of 7.00 mm and inner diameter of 3.04 mm for the measurement of their conductivities. The thickness of CoFe$_2$O$_4$/GO and FeCo/GNs hybrids is 3.96 mm and 1.28 mm, respectively. Fig. S4 and S5 show the U-I curves for the CoFe$_2$O$_4$/GO and FeCo/GNs hybrids, respectively. It is clear that both the curves show the linear relationship. The conductivities ($\sigma$) for the CoFe$_2$O$_4$/GO and FeCo/GNs hybrids are calculated to be about 8.28$\times$10$^{-4}$ and 2.93 S m$^{-1}$, respectively.

The skin depth ($\delta$) of the CoFe$_2$O$_4$/GO and FeCo/GNs hybrids were obtained using the following equation:

$$\delta = \frac{1}{\sqrt{\pi f \mu_0 \mu_r \sigma}}$$
Where $f$ is the frequency, $\mu_0$ is the permeability of vacuum ($4\pi \times 10^{-7}$), $\mu_i$ is the relative permeability of hybrids and $\sigma$ is the conductivity.

Here, we calculated the skin depth ($\delta$) with the frequency at 1 GHz. Besides, we estimate the skin depth of the hybrids using the relative complex permeability of the paraffin-containing composite, since the contained paraffin doesn’t influence the order of the complex permeability.

For CoFe$_2$O$_4$/GO hybrids, $\mu_i$ is about 1.24 at 1GHz. The skin depth ($\delta$) is about 0.5 m.

For FeCo/GNs hybrids, $\mu_i$ is about 1.82 at 1GHz. The skin depth ($\delta$) is about $7 \times 10^{-3}$ m.