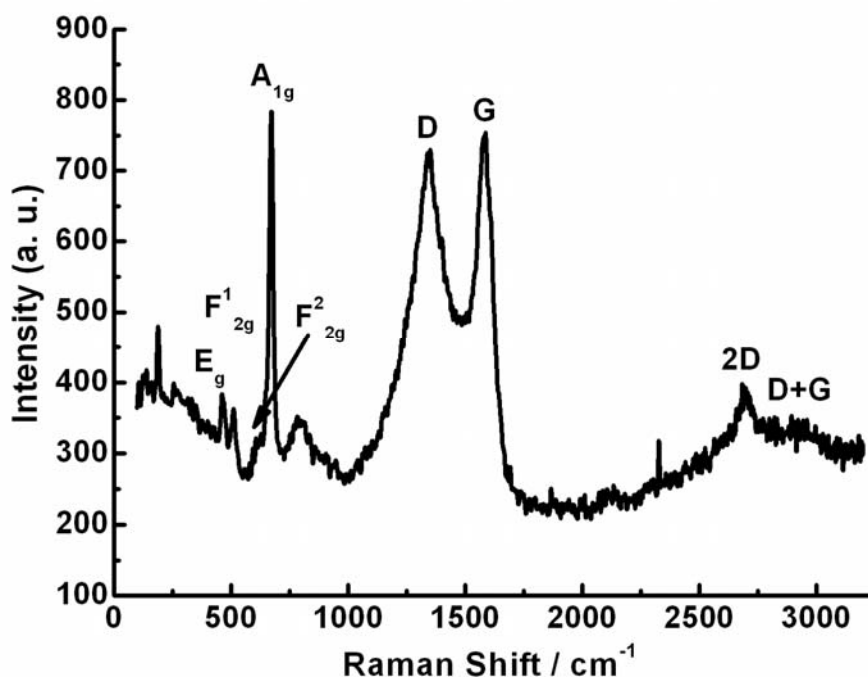


Supporting Information

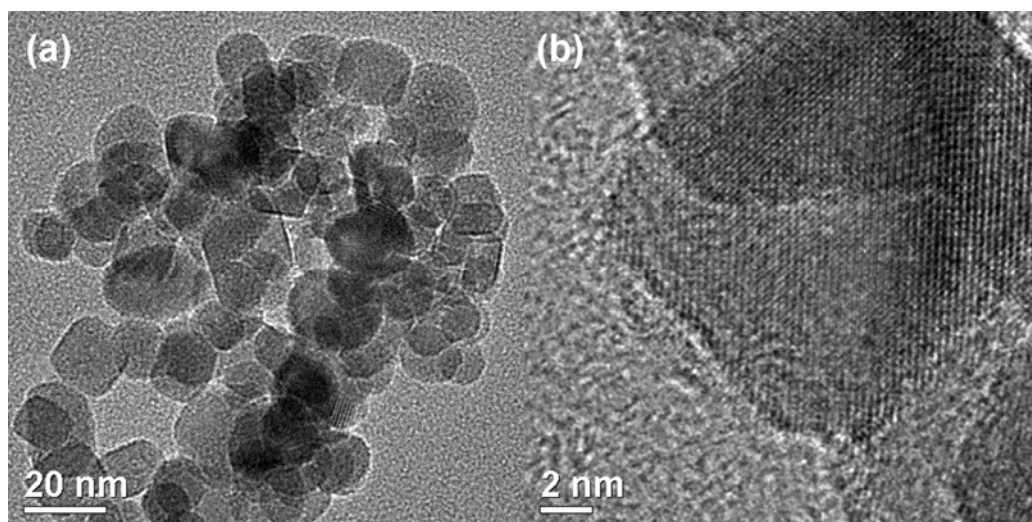


S. I. Figure 1. As described in S. I. Figure 1, the Raman spectrum shows two characterized groups. After serious analyses, one of them is attributed to the crystallized Co_3O_4 (peaks of E_g , F_{2g}^1 , A_{1g} and F_{2g}^2)^[1]. The other one can be assigned to amorphous carbon (D, 2D and D+G bands) and graphitized carbon (G band). D band is believed to result from the carbon's disorder and G band normally is ascribed to the graphitized carbon^[2,3]. Both of the D band and G band for the peapod-like samples exhibit the strong intensities, implying the co-existence of amorphous and graphitized carbons in the samples. 2D and D+G bands also confirm the presence of the disordered and randomly arranged graphitized layers in the peapod-like Co_3O_4 @carbon nanocomposites^[2].

[1] T. Yu, Y. W. Zhu, X. J. Xu, Z. X. Shen, P. Chen, C. -T. Lim, J. T. Thong, C. -H. Sow, *Adv. Mater.* **2005**, *17*, 1595-1599.

[2] G. Srinivas, Y. W. Zhu, R. Piner, N. Skipper, M. Ellerby, R. Ruoff, *Carbon*, **2010**, *48*, 630-635.

[3] A. C. Ferrari, J. C. Meyer, V. Scardaci, C. Casiraghi, M. Lazzeri, F. Mauri, S. Piscanec, D. Jiang, K. S. Novoselov, S. Roth, A. K. Geim, *Phys. Rev. Lett.* **2006**, *97*, 187401-1-187401-4



S.I. Figure 2. S. I. Figure 2a is the representative TEM image for the homemade Co_3O_4 nanoparticles. For the preparation of these Co_3O_4 nanoparticles, generally 12.5ml deionized water (D. I. water) and 12.5ml concentrated ammonia (fuming, 28wt%) are mixed homogeneously under strong magnetic stirring for 5 min. Then 5ml 1M aqueous $\text{Co}(\text{NO}_3)_2$ solution will be introduced into the former solution to form the final solution in brown color after another 30 min stirring. Afterwards, the solution is transferred into 45ml Teflon-lined autoclave and heated at 160-180°C for 16 hrs. The precipitates in the liner are washed with 3 times of deionized water and 1 time of ethanol by centrifugation. S. I. Figure 2b is the corresponding HRTEM image for the as-collected Co_3O_4 nanoparticles. The clear crystal structure shown in S. I. Figure 2b testifies the well-crystallized feature in the nanoparticles.