Electronic Supplementary Material (ESI) for RSC Advances.

$CoMoO_4 \cdot 0.9H_2O$ Nanorods Grown on Reduced Graphene Oxide as Advanced Electrochemical Pseudocapacitor Materials

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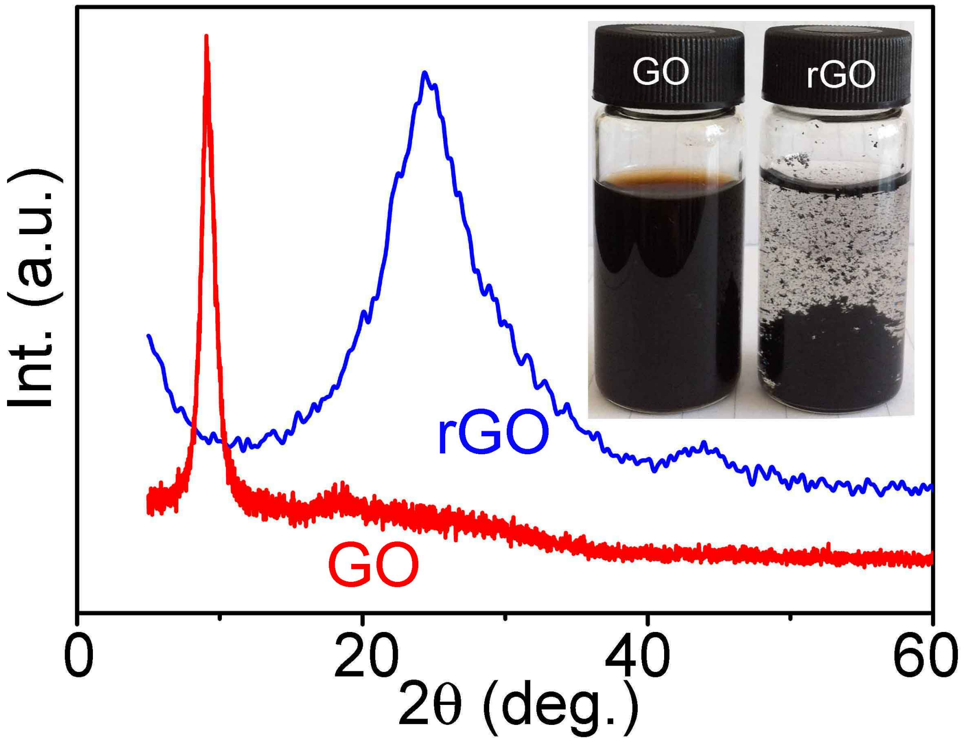

Figure S1. Powder XRD patterns of homogeneous GO aqueous dispersion before and after hydrothermal reduction at 180 °C for 15h, insert shows the corresponding photograph.

In order to further demonstrate the GO can be reduced to rGO during hydrothermally treated, we performed an experiment. In a typical synthetic procedure, 30 mg of graphene oxide was dispersed in 45 mL deionized water by ultrasonication for 2 h to form a homogeneous suspension, as-obtained solution was transferred into a 50 mL polytetrafluoroethylene (PTFE) (Teflon)-lined autoclave and maintained at 180 °C for 15 h in an electric oven. After being cooled to room temperature naturally, the precipitate was collected and washed with deionized water and ethanol for several times by centrifugation, then dried at 60 °C overnight. Clearly, the color of GO solution changed from light brown to black (insert in Figure S2) after hydrothermally treated. The black color is evident of the partial restoration of the conjugation network within the carbon structure.[1] Figure S2 shows the powder XRD patterns of GO and rGO samples. For GO, a strong peak at 9.1º is observed, indicating the (002) plane of GO.[2] However, after hydrothermal process, the (002) peak shifts to around 24.5º, demonstrating that the GO was reduced to graphene.

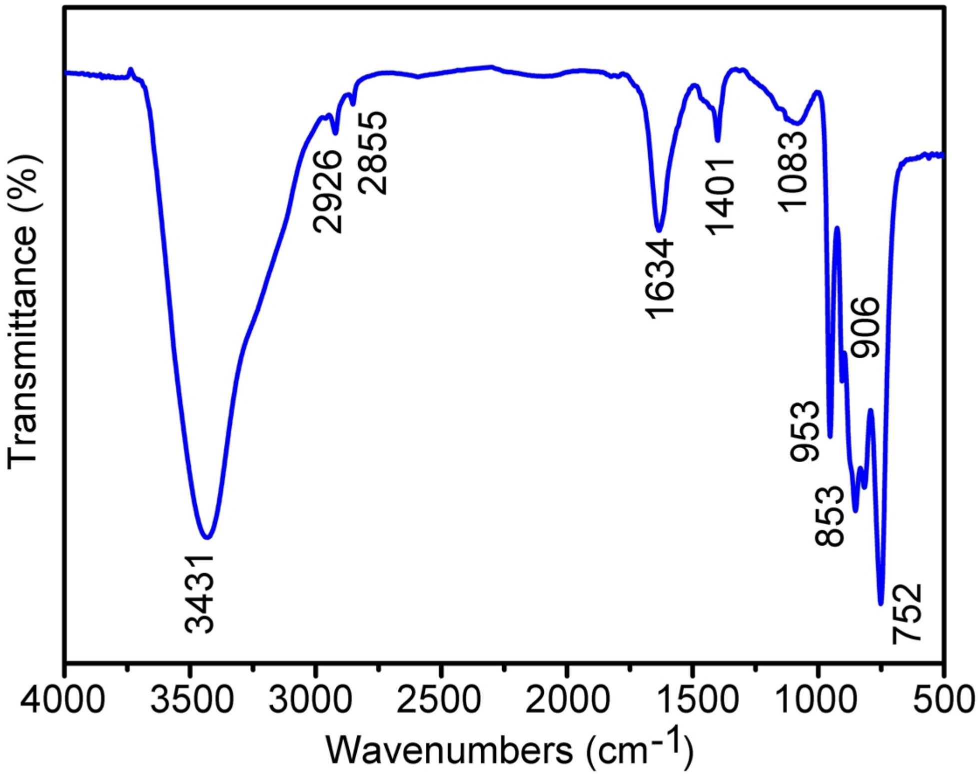

Figure S2. FTIR spectra of as-prepared $CoMoO_4 \cdot 0.9H_2O$/rGO hybrid composites.

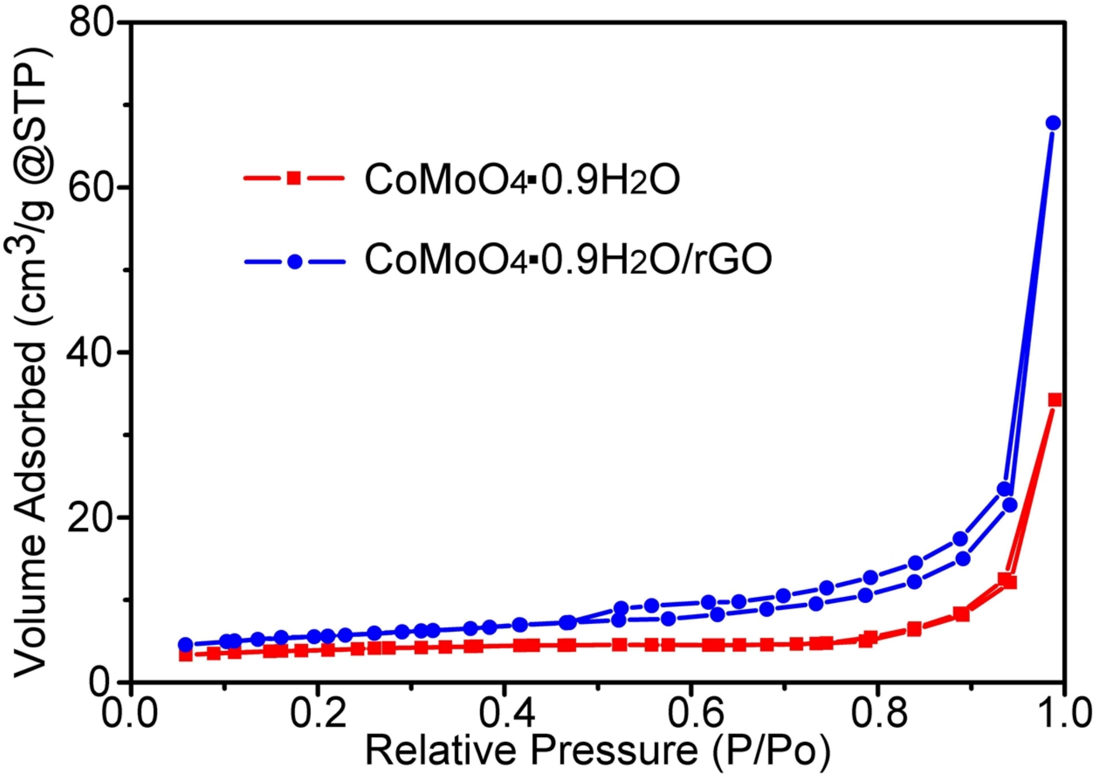

Figure S3. Nitrogen adsorption-desorption isotherms of the $CoMoO_4 \cdot 0.9H_2O$ and $CoMoO_4 \cdot 0.9H_2O$/ rGO hybrid composites.

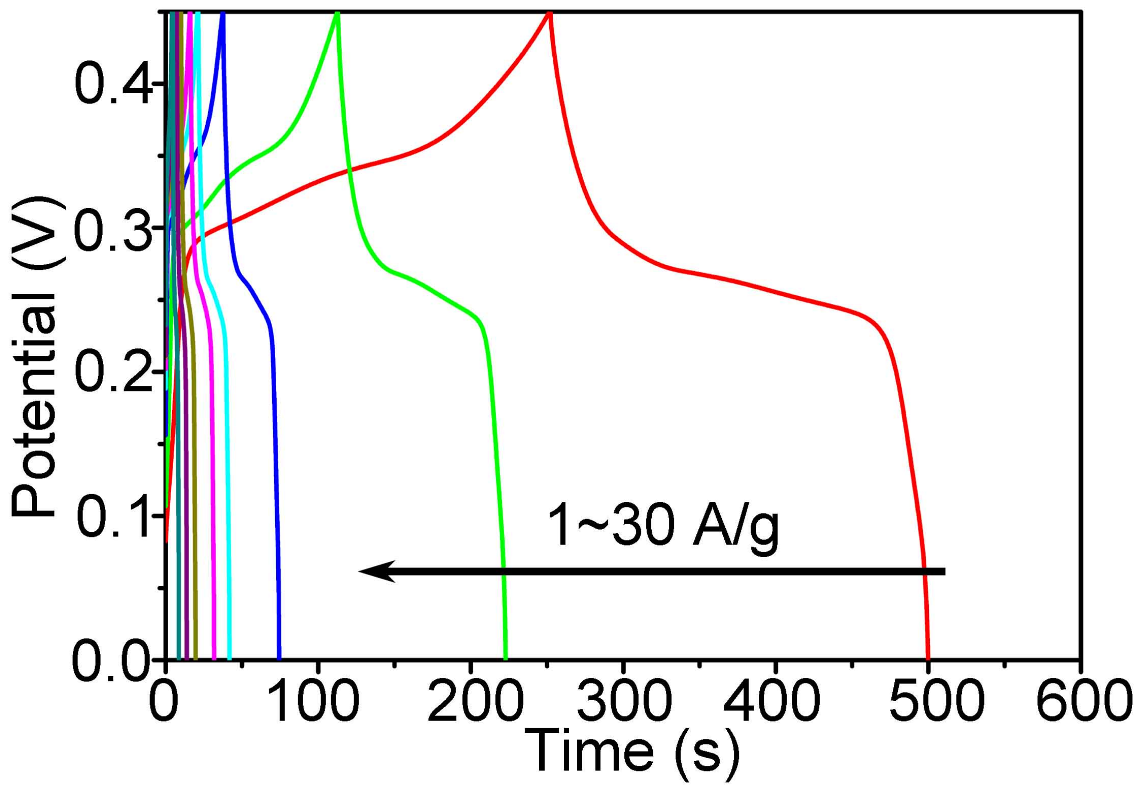

Figure S4. Charge-discharge behavior of the $CoMoO_4 \cdot 0.9H_2O$ at different current densities.

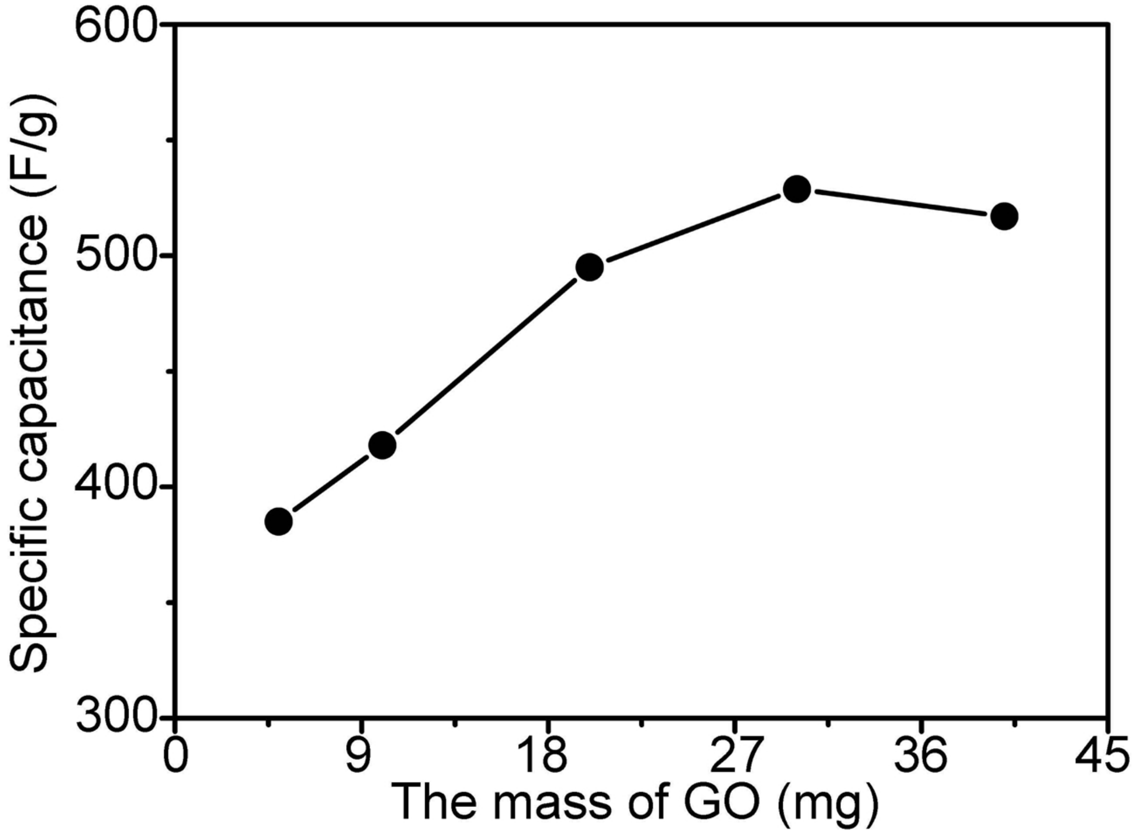

Figure S5. The specific capacitance of the $CoMoO_4 \cdot 0.9H_2O$/rGO hybrid composites as a function of different mass of GO.

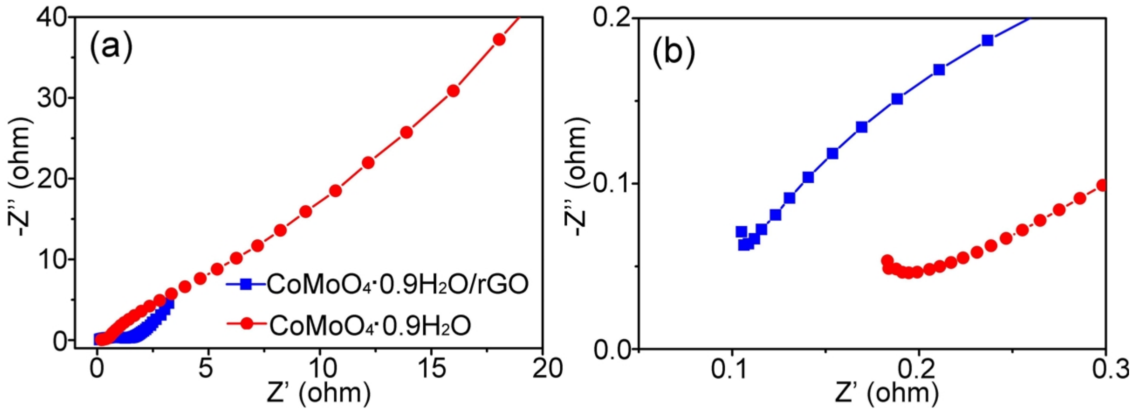

Figure S6. (a) EIS spectra and (b) the corresponding magnified high-frequency regions of the $CoMoO_4 \cdot 0.9H_2O$ and $CoMoO_4 \cdot 0.9H_2O$/rGO hybrid composites.

Electrochemical impedance spectroscopy (EIS) has been applied to investigate electrical conductivity and ion transfer of the supercapacitor electrodes. Figure S6 shows the Nyquist impedance spectra of the $CoMoO_4 \cdot 0.9H_2O$ and $CoMoO_4 \cdot 0.9H_2O$/rGO composites electrode materials. The EIS results demonstrate that equivalent series resistance of the $CoMoO_4 \cdot 0.9H_2O$/rGO electrode (0.105 Ω) is much smaller than that of the $CoMoO_4 \cdot 0.9H_2O$ electrode (0.18 Ω), showing the improved conductivity of the $CoMoO_4 \cdot 0.9H_2O$/rGO electrode after the introduction of rGO.

References

1. Y. Zhou, Q. L. Bao, L. A. L. Tang, Y. L. Zhong, K. P. Loh, *Chem. Mater.*, 2009, **21**, 2950.

2. W. B. Yue, S. H. Jiang, W. J. Huang, Z. Q. Gao, J. Li, Y. Ren, X. H. Zhao, X. J. Yang, *J. Mater. Chem. A*, 2013, **1**, 6928.