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Supporting Information

One-pot synthesis of mesoporous $NiCo_2O_4$ nanoplatelet and graphene hybrid and its oxygen reduction and evolution activities as an efficient bi-functional electrocatalyst

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XPS spectra of $NiCo_2O_4$ and $NiCo_2O_4$/G

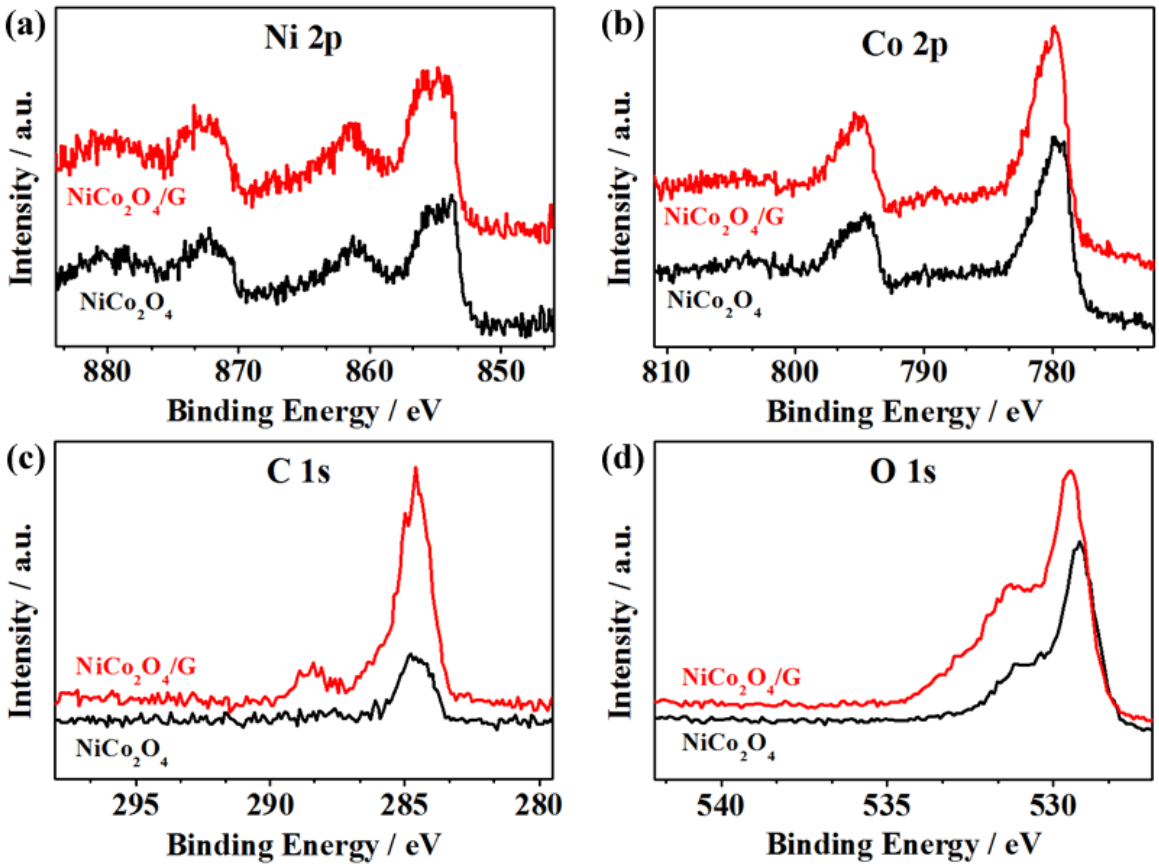

Figure S1. XPS spectra of $NiCo_2O_4$ (black) and $NiCo_2O_4$/G (red) of the elements (a) Ni 2p (b) Co 2p (c) C 1s and (d) O 1s

For the XPS spectra of the elements Ni, Co, and C, no significant shift in the binding energy is observed between $NiCo_2O_4$ and $NiCo_2O_4$/G (Figure S1a, b, c), which is consistent with the previous work reported by Dai's group on Co_3O_4 and graphene hybrid.[1] However, we have observed a shift in the binding energy for the XPS spectrum of the element O in $NiCo_2O_4$/G to a higher value compared to that of $NiCo_2O_4$ (Figure S1d). Hence, this is an indication that the hybridization of the metal oxides and graphene sheets is probably occurring through the oxygen species of GO which are likely reacted with the metal precursors at the time of the one-pot synthesis. In a similar work reported on the hybridization of manganese oxide nanostructures with graphene sheets, the authors have put forward the mechanism as the formation of a covalent coordination bond between the metal cation and the oxygen functionalities of GO which act as anchor sites for the metal oxide growth.[2]

References

1.Y. Liang, Y. Li, H. Wang, J. Zhou, J. Wang, T. Regier and H. Dai, *Nat Mater*, 2011, **10**, 780-786.
2.S. Chen, J. Zhu, X. Wu, Q. Han and X. Wang, *ACS Nano*, 2010, **4**, 2822-2830.