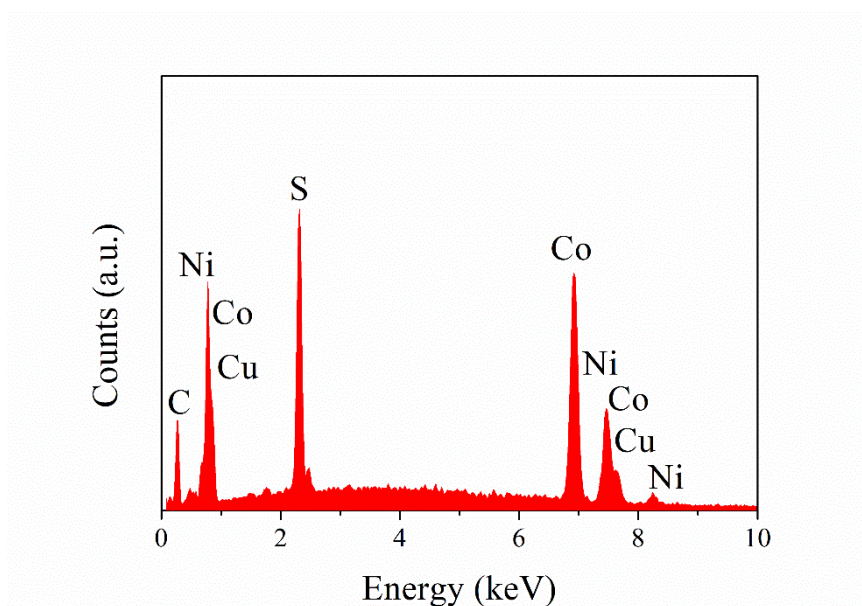


## Supporting Information

# Mesoporous Hollow Nested Nanospheres of Ni, Cu, Co-Based Mixed Sulfides for Electrocatalytic Oxygen Reduction and Evolution

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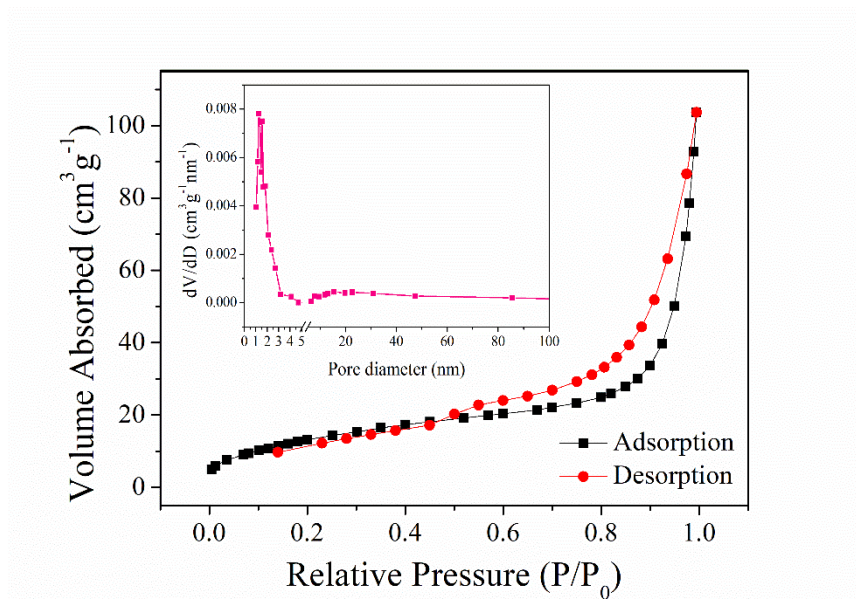
*Key Laboratory of Aerospace Advanced Materials and Performance of Ministry of Education, School of Materials Science and Engineering, Beihang University, Beijing, 100191, P. R. China*



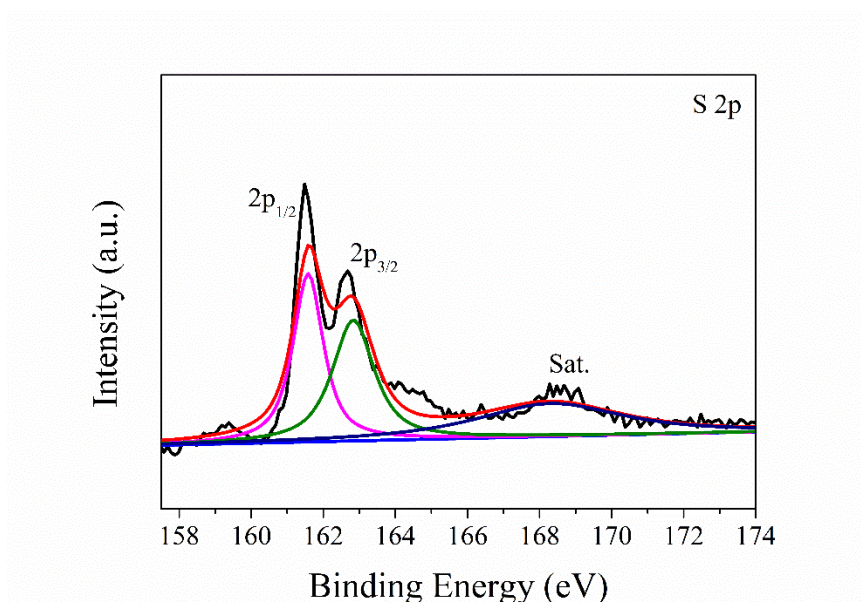
**Figure S1** EDX spectrum of the NiCuCo-sulfides nanospheres.

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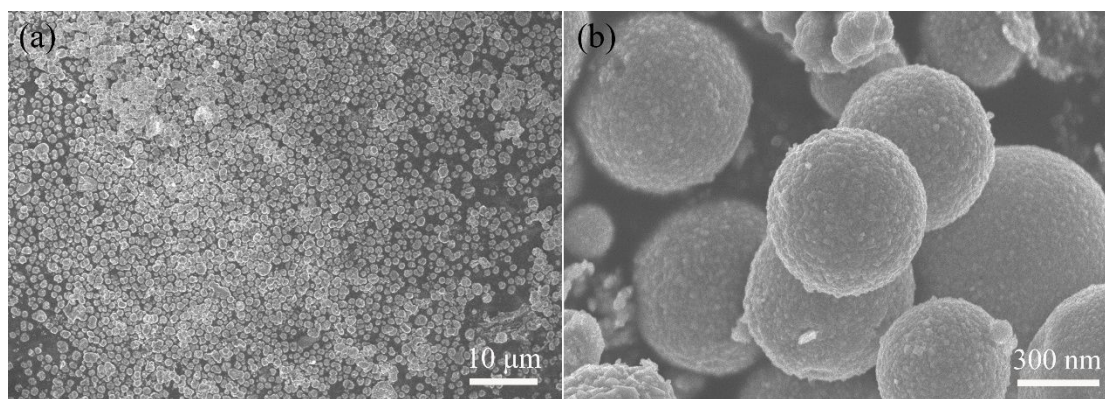
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E-mail address: songmei\_li@buaa.edu.cn.



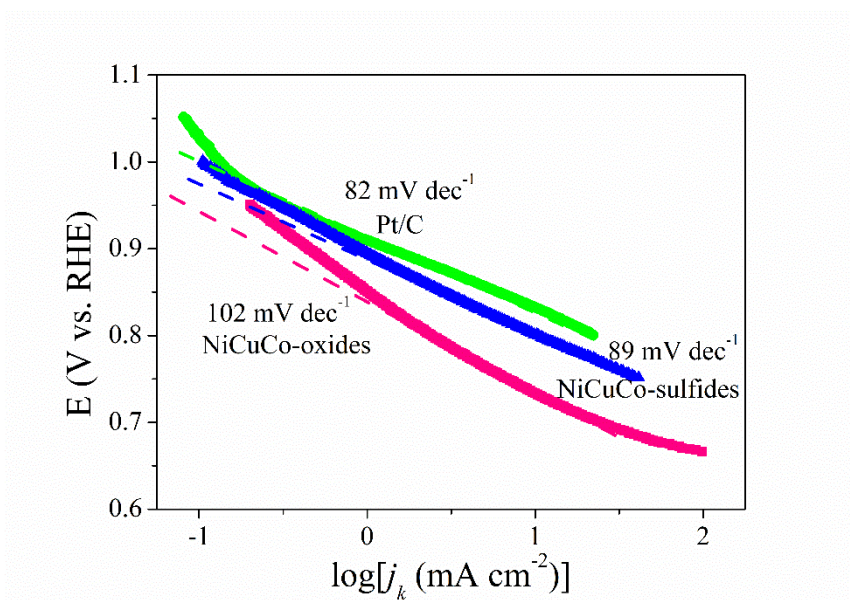
**Figure S2** (a)  $\text{N}_2$  adsorption-desorption isotherms of the NiCuCo-oxides nanospheres and the inset is the pore size distribution plot.



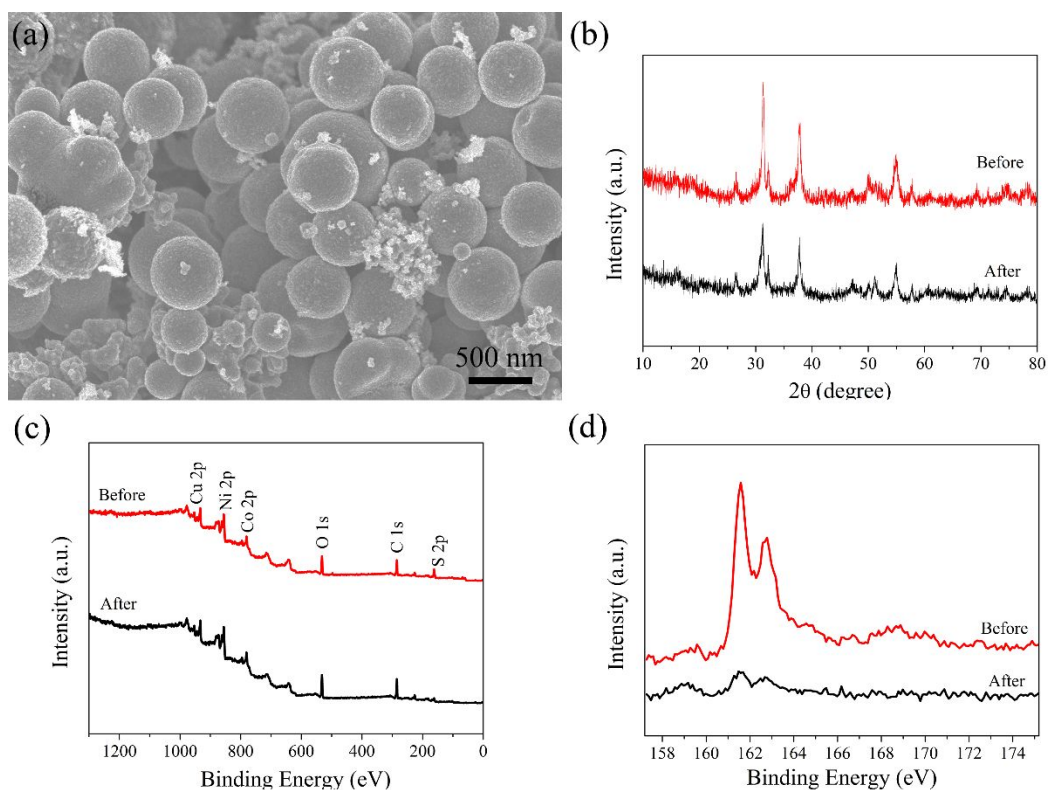
**Figure S3** XPS spectrum of S 2p for the NiCuCo-sulfides nanospheres.



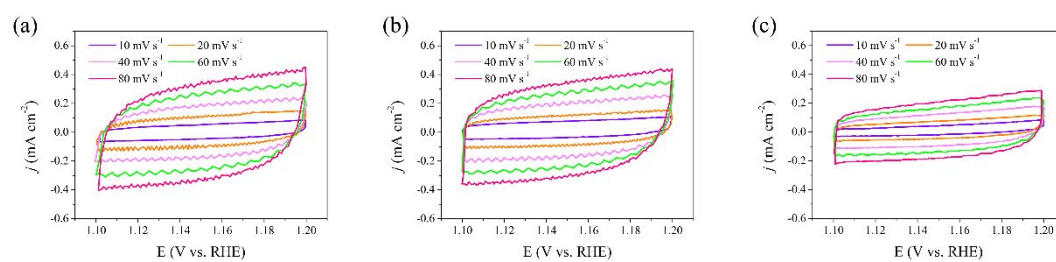
**Figure S4** SEM images of the NiCuCo-sulfides nanospheres with Nafion additives in glassy carbon electrodes.



**Figure S5** Comparison of Tafel plots of the NiCuCo-sulfides, NiCuCo-oxides and Pt/C obtained from the ORR LSV curves at 1600 rpm.

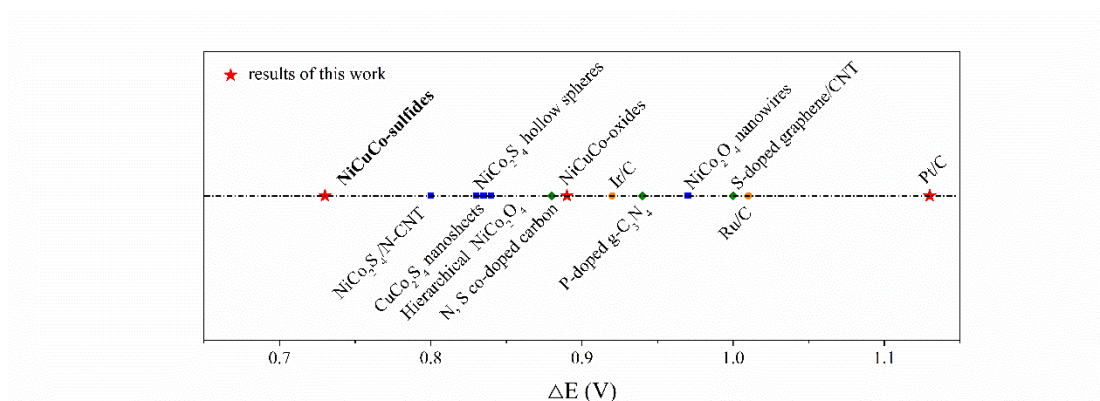


**Figure S6** (a) SEM image of the NiCuCo-sulfides after stability test; (b) XRD patterns, (c) XPS survey scans and (d) XPS spectra of S 2p of the NiCuCo-sulfides before and after cyclic stability test.



**Figure S7** Cyclic voltammetry curves measured in a potential range (1.1-1.2 V vs. RHE) at scan rates from 10 to 80 mV/s for (a) NiCuCo-sulfides, (b) NiCuCo-oxides and (c) Pt/C.





**Figure S8** Comparison of ORR and OER bifunctional activities of samples in this work with representative electrocatalysts in references, which were evaluated by the potential difference  $\Delta E$  ( $\Delta E = E_{OER} - E_{ORR} = E_{j=10} - E_{1/2}$ ) between the potential under the OER current density of  $10 \text{ mA cm}^{-2}$  ( $E_{j=10}$ ) and the half-wave potential of ORR ( $E_{1/2}$ ).<sup>1-9</sup>

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