Porous Co$_3$O$_4$/SnO$_2$ quantum dots (QDs) heterostructure with abundant oxygen

vacancies and Co^{2+} ions for highly efficient gas sensing and oxygen evolution

reaction

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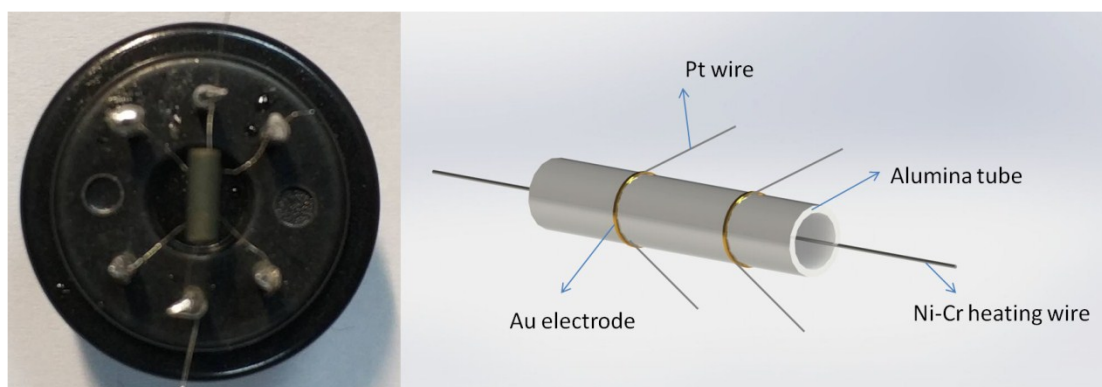*Corresponding author. E-mail: gaomz@lzu.edu.cn; Tel: +86 931 8914160*
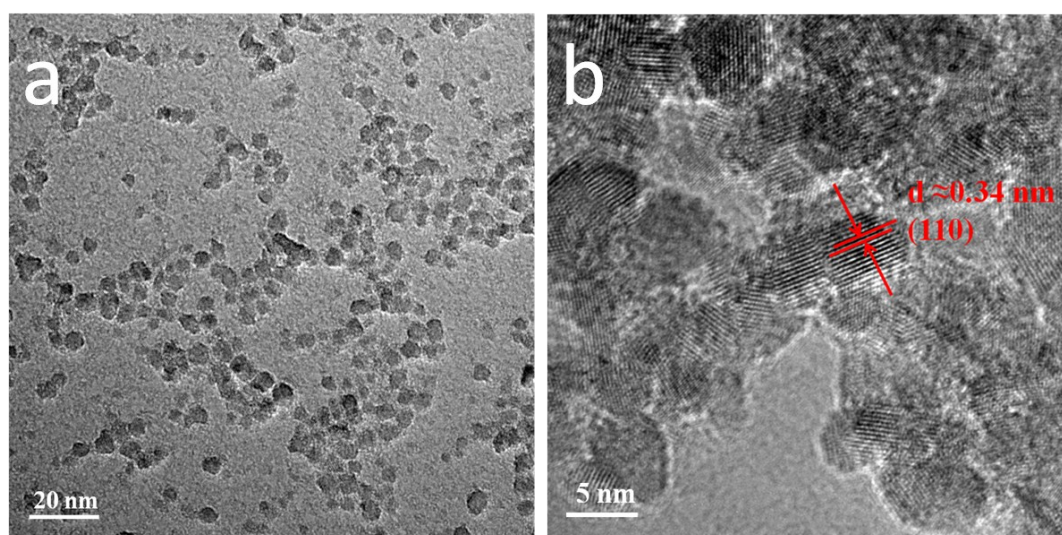

Fig. S1 One of the prepared gas sensor.

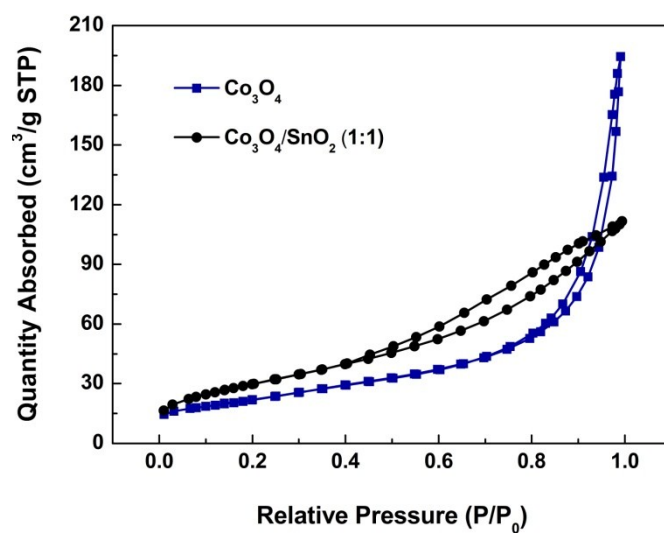

Fig. S2 High-resolution TEM images of SnO$_2$QDs

Fig. S3 N$_2$ adsorption-desorption isotherm exhibits a typical Langmuir hysteresis indicating presence of well-defined mesopores.

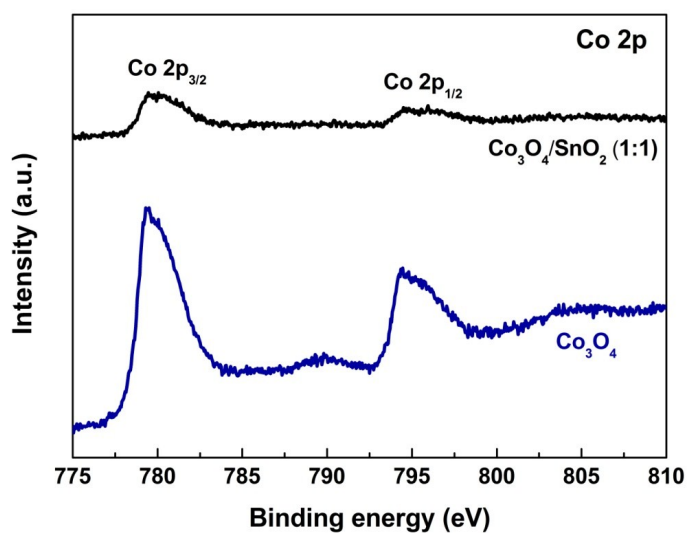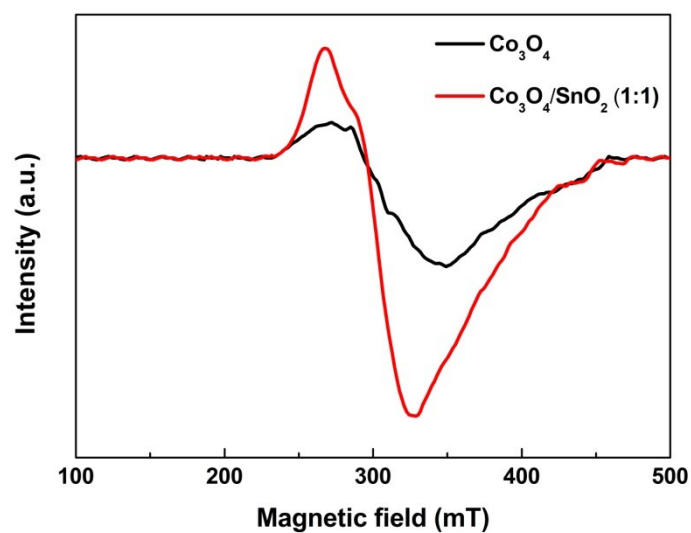Fig. S4 Co 2p XPS spectra of Co$_3$O$_4$/SnO$_2$QDs heterostructures and Co$_3$O$_4$ nanosheets

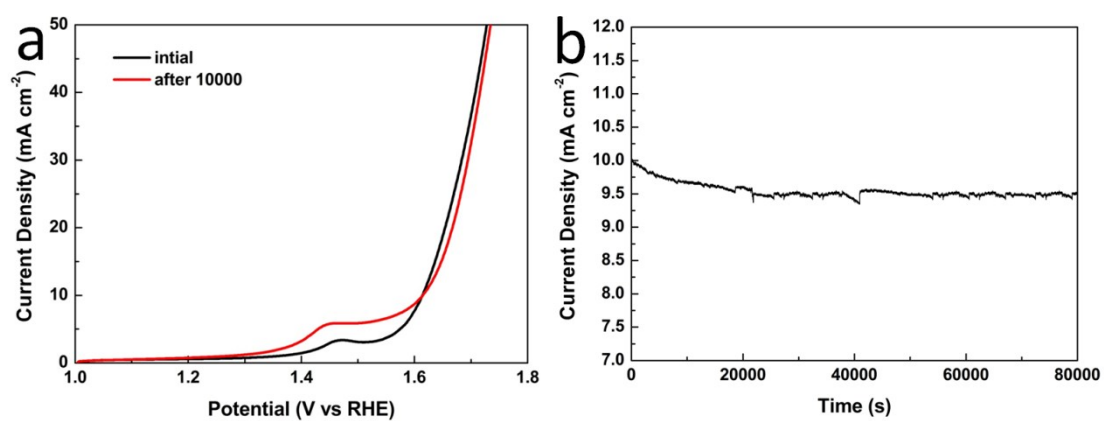Fig. S5 ESR spectra of Co_3O_4 nanosheet and Co_3O_4/SnO_2QDs (1:1) heterostructures.

Fig. S6 Stability of the Co_3O_4/SnO_2QDs (1:1) heterostructures with an initial LSV polarization curve and after 1000 cycles in 1 M KOH at a scan rate of 0.01 V/s; b) a current-time curve obtained for OER in the presence of Co_3O_4/SnO_2QDs (1:1) heterostructures at 1.61 V *vs*. NHE.
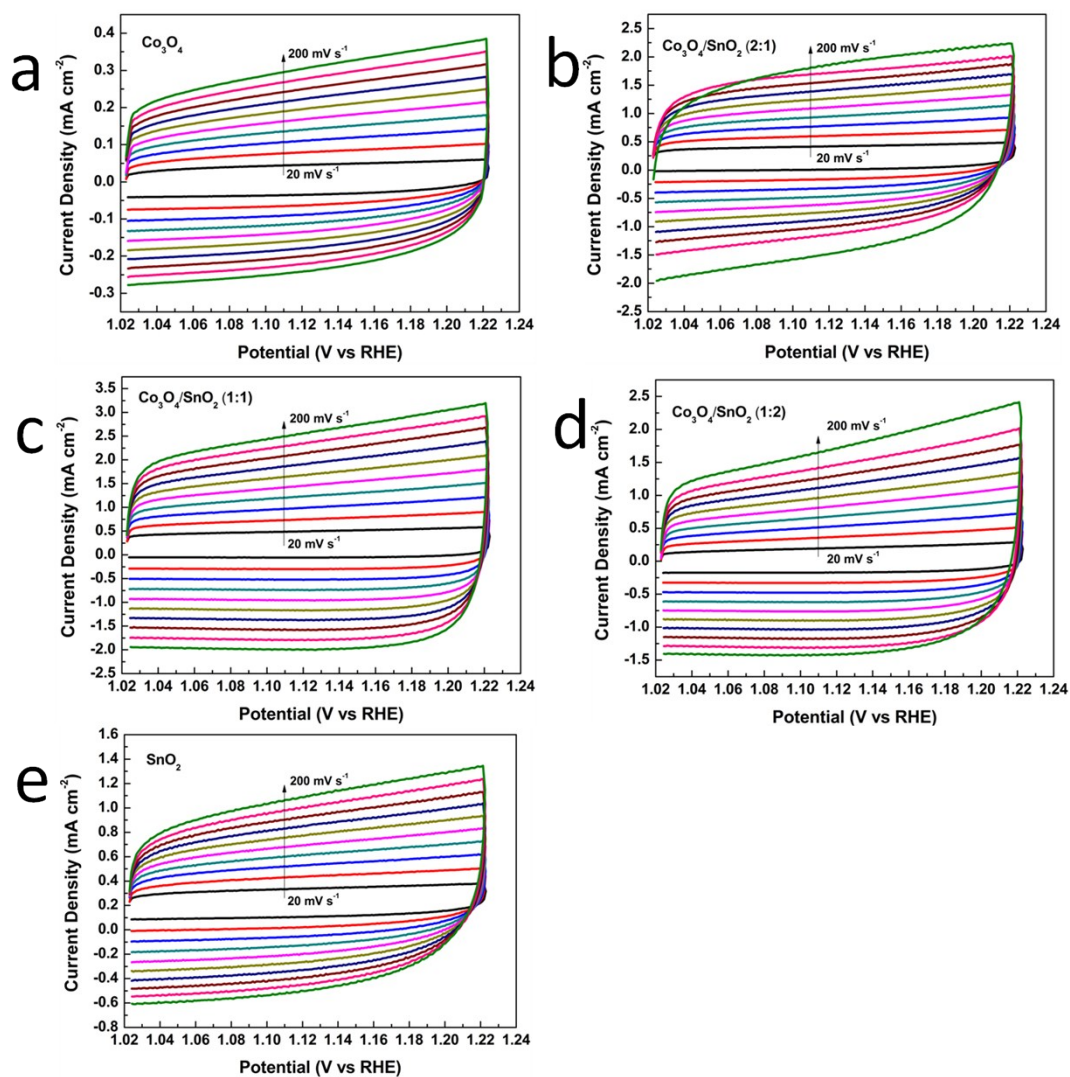
Fig. S7 Cyclic voltammetry curves of the as-prepared samples at scan rates of 20, 40, 60, 80, 100, 120, 140, 160, 180 and 200 mV s^{-1}.