Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information

Reactive-template fabrication of porous NiO nanowires for electrocatalytic O_2 evolution reaction

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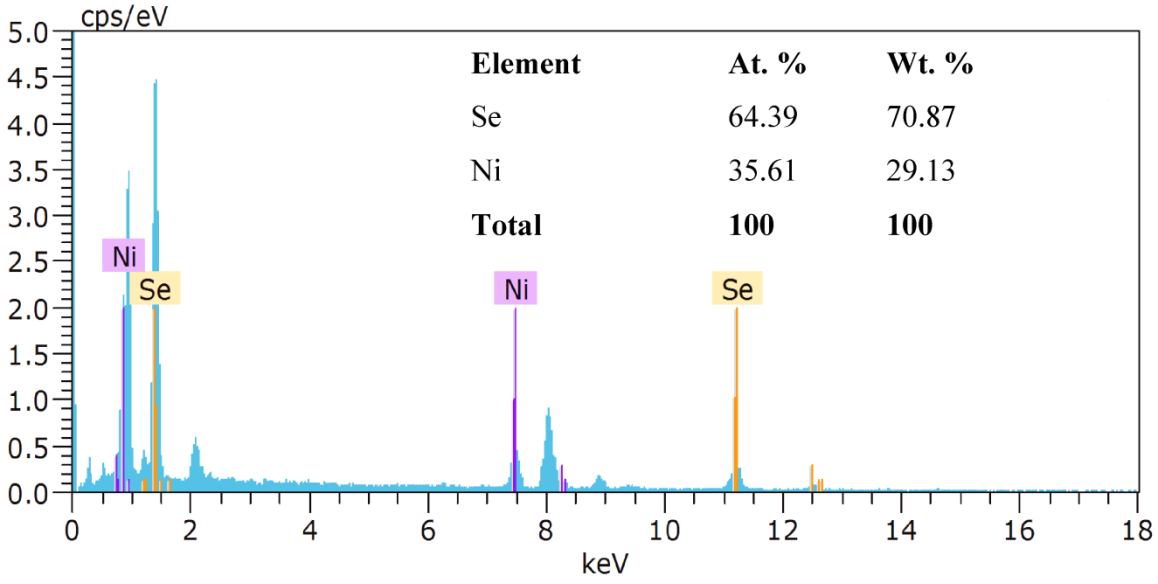

Fig.S1 Energy dispersive x-ray (EDX) profile of $Ni_{0.85}Se$ nanowires.

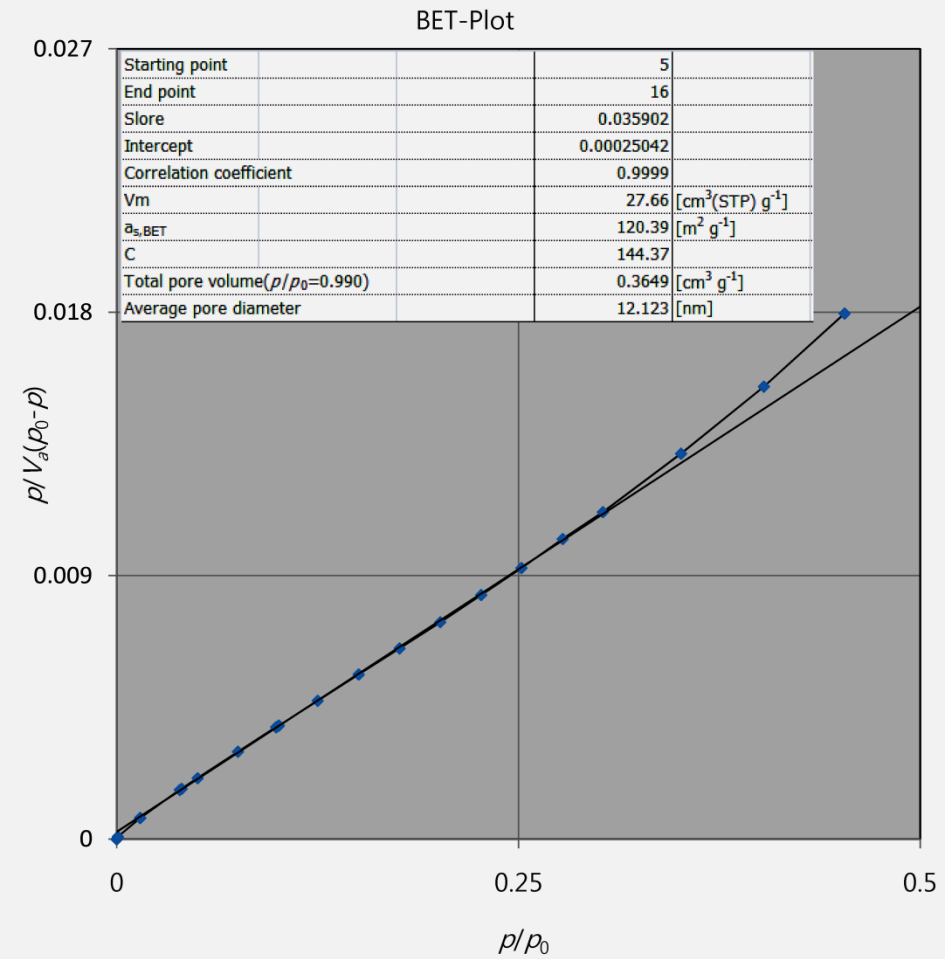

Fig.S2 BET plot of porous NiO nanowires.

Synthesis of plate like -NiO nanoparticles

The plate like NiO nanoparticles were synthesized by a facile hydrothermal method. In a typical synthesis process, 1mmol $NiSO_4.6H_2O$ (Sigma-Aldrich, 99%) was dissolved in 40 ml ultra pure water. Then 40 ml 2 M NaOH (Sigma-Aldrich, 98%) solution was added under vigorous stirring. The mixture was then transferred into a Teflon-lined autoclave (100 ml) and heated at 180°C for 24 hours in an air-flow electric oven. After cooling to room temperature, the product was collected by centrifugation and washed thoroughly with ultra pure water several times. Then, the obtained product was dried at 60°C for 12 h in an air-flow electric oven. Finally, the plate like NiO nanoparticles were prepared by annealing the obtained $Ni(OH)_2$ product (as dried at 60°C for 12 h) at 500°C for 5 h.

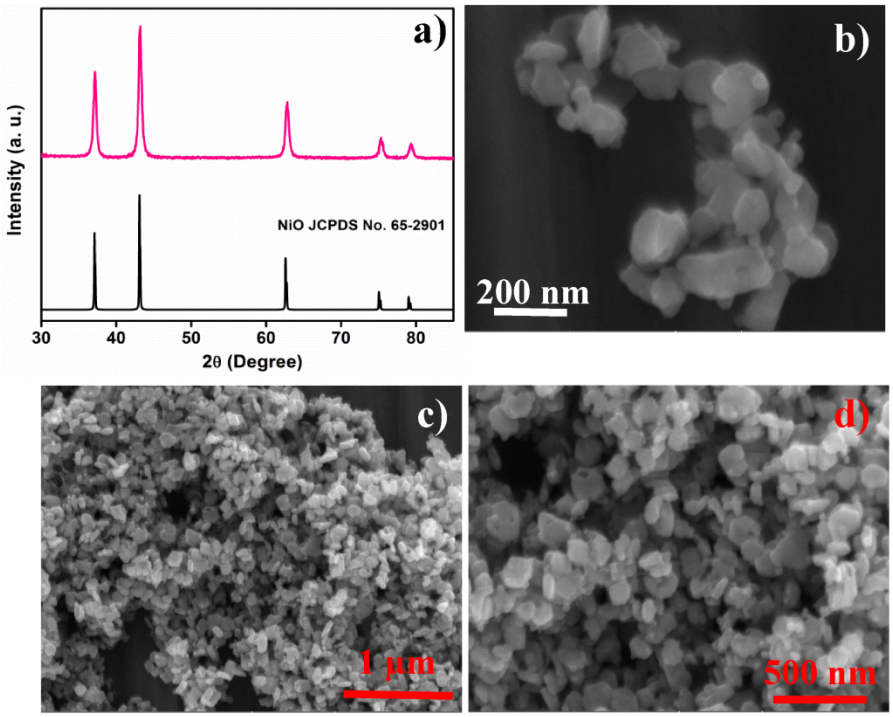

Fig.S3 Characterisation profiles of NiO nanoparticles. (a) XRD spectra; and (b-d) FE-SEM images.

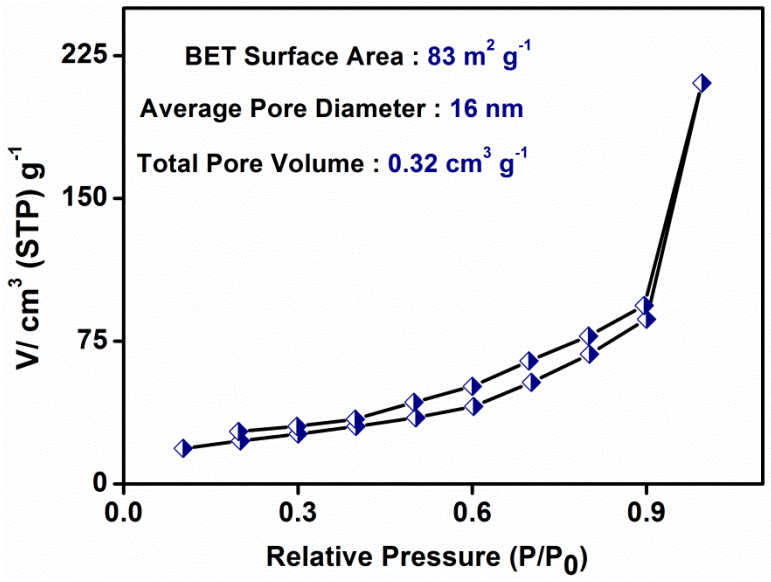

Fig.S4 Nitrogen adsorption-desorption isotherm for synthesized NiO nanoparticles.

Oxygen overpotential calculations

The oxygen overpotential (η) for oxygen evolution reaction (OER) has been calculation using the following equation (1) which is commonly acceptable to express the potential in terms of oxygen overpotential.

$$\eta = E_{irr} - E_{rev} \qquad (1)$$

where, E_{irr} is the irreversible electrode potential. i.e., the measured electrode potential (E_{meas}) and E_{rev} is the reversible electrode potential. For the OER, E_{rev} = 1.23 - 0.059 pH vs. SHE. At pH 14 (0.5 M KOH), E_{rev} = 0.404 V *vs.* SHE. When the reference electrode is Ag/AgCl electrode, E_{rev} = 0.207 V. In the present case 'η' is related to the voltage measured (E_{meas}) on the Ag/AgCl scale as follows (2):

$$\eta = E_{meas} - 0.207\ V \qquad (2)$$

References

1. M. R. Gennero de Chialvo and A. C. Chialvo, *Electrochim. Acta,*1988, **33**, 825.

2. I. M. Sadiek, A. M. Mohammad, M. E. El-Shakre, M. I. Awad, M. S. El-Deab and B. E. El-Anadouli, *Int. J. Electrochem. Sci.,* 2012, **7,** 3350.