

1. Experimental Section

The precursor of nickel hydroxide was synthesized by hydrothermal reaction according to the literature.¹ In a typical procedure, 1.6 g NiCl₂·6H₂O was dissolved in 40 mL 6 M aqueous ammonia under stirring for 15 min. The resulting mixture was transferred into a 50 mL autoclave, heated at 180 °C for 12 h and then cooled to room temperature. After filtering and washing with deionized water and anhydrous ethanol for three times, respectively, the resulting solid product was dried at 80 °C under ambient atmosphere. NiO material was obtained by heating the as-prepared Ni(OH)₂ at 300 °C for 2 h.

The product was characterized by X-ray diffractometer (Bruker D8 advance) using Cu K α radiation ($\lambda=0.15406$ nm). The electrochemical performances were studied with a CHI-660D electrochemical working station in a conventional three-electrode configuration equipped with a Pt foil of 1 cm² and a saturated calomel electrode as counter and reference electrodes, respectively. The electrolyte used was KOH solution with appropriate concentration of K₃Fe(CN)₆/K₄Fe(CN)₆. The work electrode was prepared by pressing the mixture of NiO, acetylene black and polytetrafluoroethylene with a weight ratio of 75: 15: 10 on a piece of foamed nickel of about 1 cm² (15 Mpa). Electrochemical impedance spectra were measured at equilibrium open-circuit potential (0 V), varying frequency from 0.01 to 100 000 Hz with amplitude of 5 mV.

1. J. Liang and Y. Li, *Chem. Lett.*, 2003, **32**, 1126.

2. XRD pattern of NiO

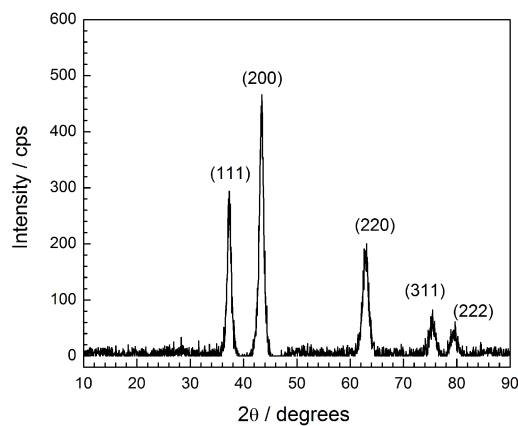


Fig. S1 The XRD pattern of the as-prepared NiO material.

The peaks at the 2θ values of 36.9° , 43.0° , 62.5° , 74.9° and 79.0° are ascribed to the planes of (111), (200), (220), (311) and (222) of NiO (JCPDS: 65-6920).

3. The fitting of electrochemical impedance spectroscopy

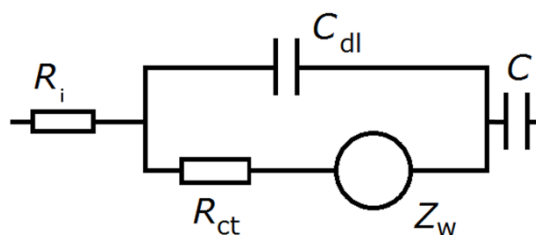


Fig. S2 An equivalent circuit used to fit the Nyquist spectra.

Tab. S1 The fitted impedance parameters of NiO electrode at different temperature in 4 M KOH based on the proposed equivalent circuit using the software Zview.

temperature	R_i / Ω	R_{ct} / Ω	C_{dl} / mF	Z_w^{-1} / Ω^{-1}	C / F	Chi squared
15°C	1.138	0.426	3.03	1.15	0.612	8.48E-4
0°C	1.759	0.787	1.44	0.5517	0.414	6.34E-4
-20°C	2.772	1.328	1.66	0.3559	0.826	6.80E-4

Tab. S2 The fitted impedance parameters of NiO electrode at -20 °C in 4 M KOH including different concentration of $\text{K}_3\text{Fe}(\text{CN})_6/\text{K}_4\text{Fe}(\text{CN})_6$.

electrolyte	R_i / Ω	R_{ct} / Ω	C_{dl} / mF	Z_w^{-1} / Ω^{-1}	C / F	Chi squared
a	2.772	1.328	1.66	0.3559	0.826	6.80E-4
b	2.037	0.748	2.38	0.3817	0.806	5.99E-4
c	1.448	0.799	3.29	0.4627	0.825	1.07E-3
d	1.027	0.581	3.68	0.5739	0.628	1.37E-3

a) 0 M, b) 0.001 M/0.001 M, c) 0.005 M /0.005 M and d) 0.009 M/0.009 M.