Supplementary information for

The preparation of NiO/Ni-N/C nanocomposites and its electrocatalytic performance for methanol oxidation reaction

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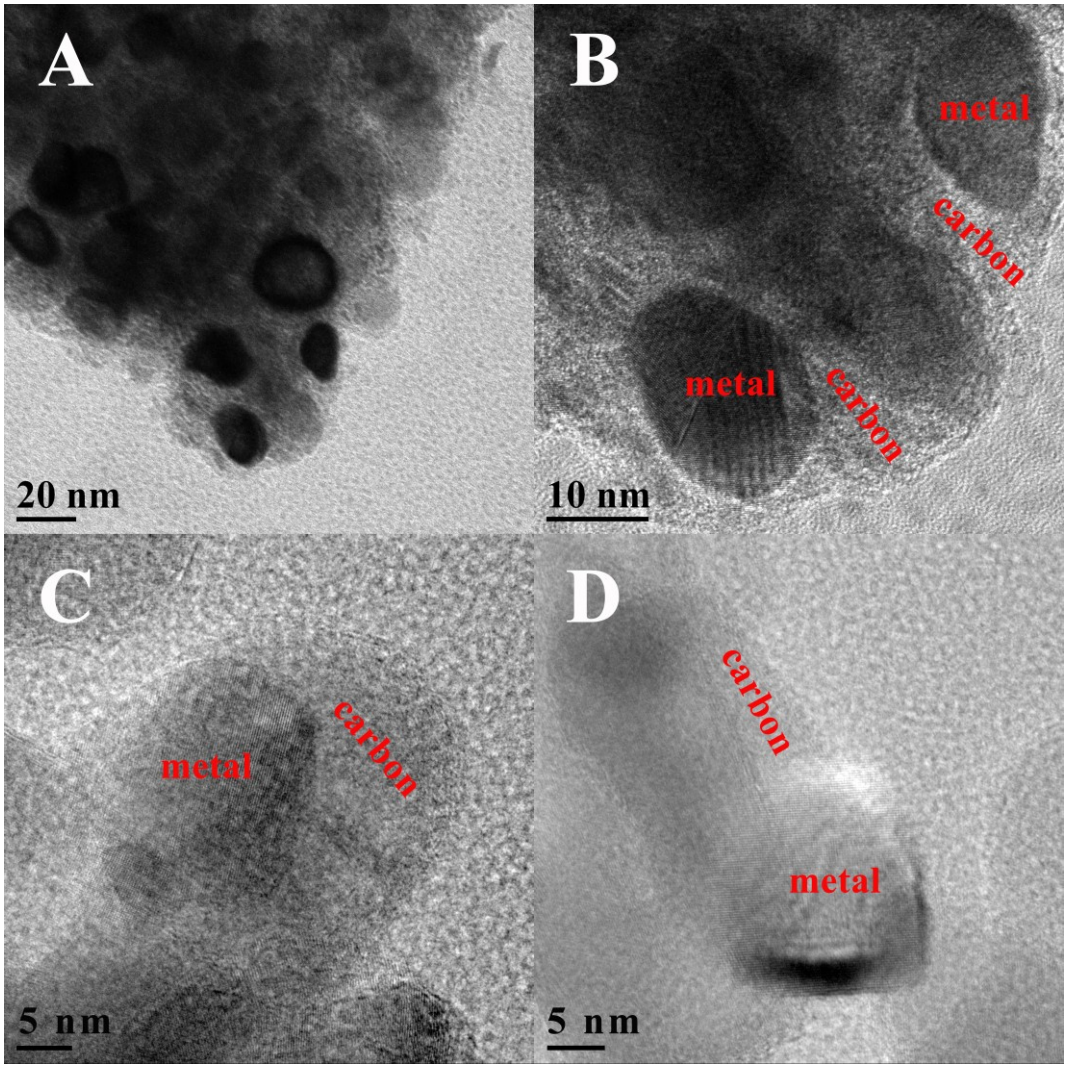

Fig. S1 (A-D) TEM images of the NiO/Ni-N/C_{500} nanocomposites

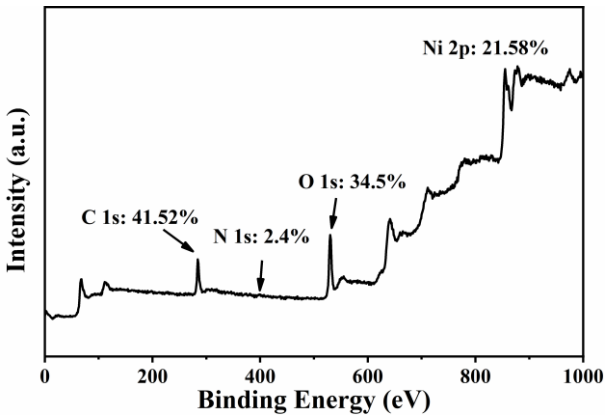

Fig. S2 XPS survey spectra of the NiO/Ni-N/C_{500} nanocomposites

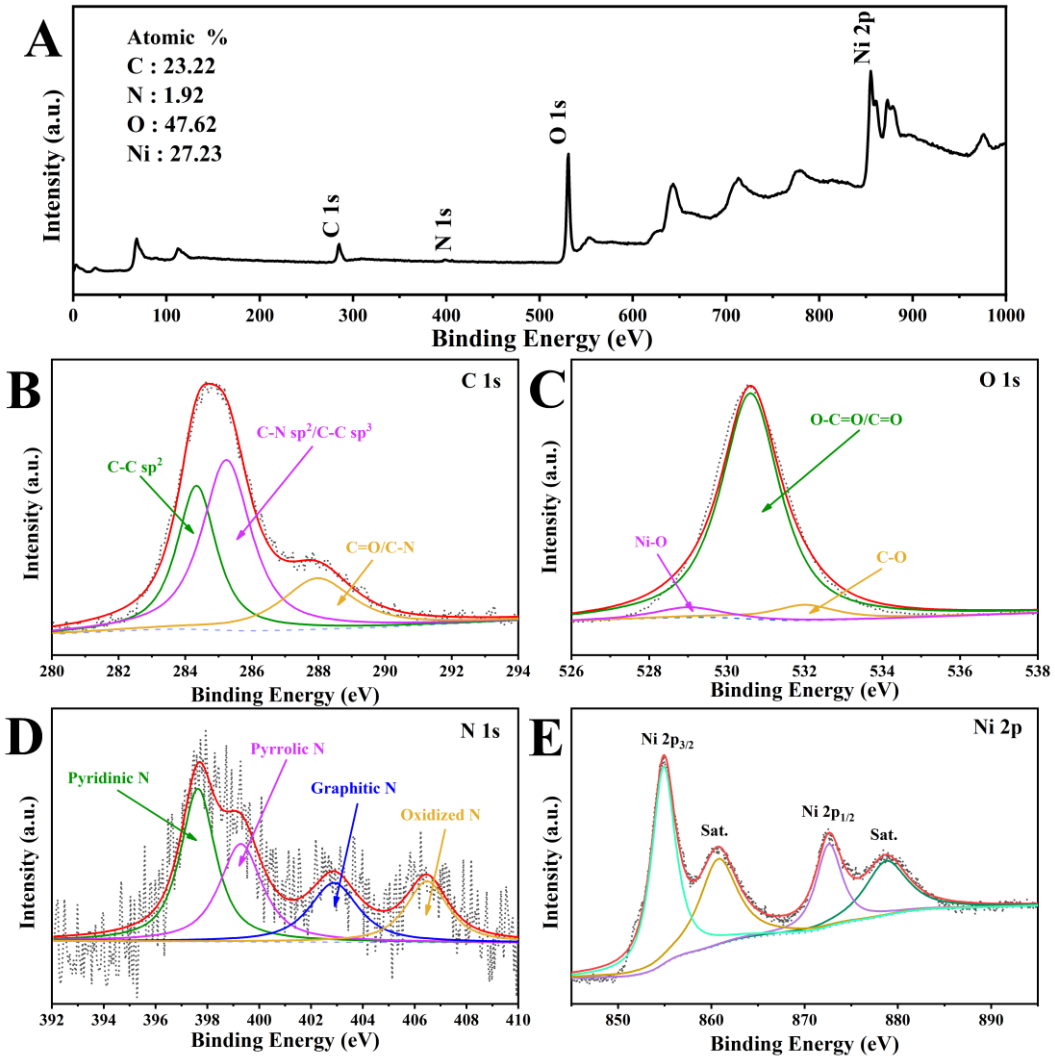

Fig. S3 XPS survey spectra of (A) C 1s (B), O 1s (C), N 1s (D) and Ni 2p (E) of the $Ni(OH)_2$/N-C nanocomposites (The contents of C, N, O and Ni elements on the catalyst surface were approximately equal to 23.22, 1.92, 47.62 and 27.23 atom %, respectively.)

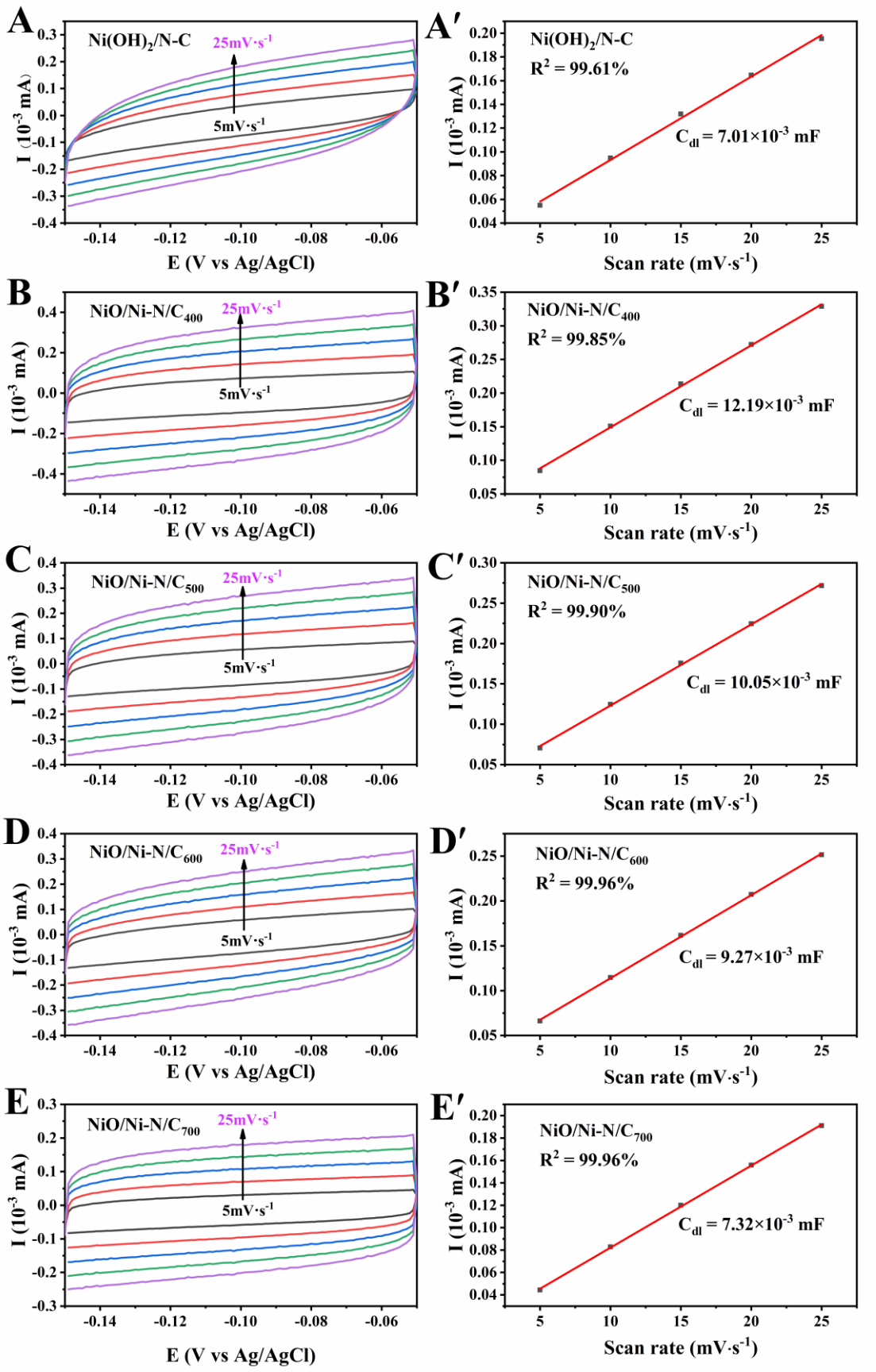

Fig. S4 CV curves of (A) the $Ni(OH)_2$/N-C, (B) the NiO/Ni-N/C_{400}, (C) the NiO/Ni-N/C_{500}, (D)

the NiO/Ni-N/C_{600} and (E) the NiO/Ni-N/C_{700} from -0.15 V to -0.05 V vs Ag/AgCl at scan rates of 5, 10, 15, 20 and 25 $mV \cdot s^{-1}$ in 1.0 M KOH. The capacitive current ($(I_a-I_c)/2$) at -0.1 V vs Ag/AgCl as a function of various scan rates for (A') the $Ni(OH)_2$/N-C, (B') the NiO/Ni-N/C_{400}, (C') the NiO/Ni-N/C_{500}, (D') the NiO/Ni-N/C_{600} and (E') the NiO/Ni-N/C_{700}; the C_{dl} equal to the slopes

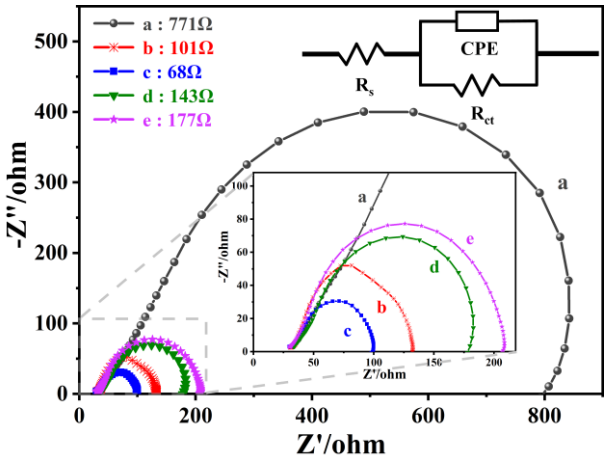

Fig. S5 Nyquist plots of (a) the $Ni(OH)_2$/N-C/GCE, (b) the NiO/Ni-N/C_{400}/GCE, (c) the NiO/Ni-N/C_{500}/GCE, (d) the NiO/Ni-N/C_{600}/GCE and (e) the NiO/Ni-N/C_{700}/GCE in 1.0 M KOH containing 3.0 M CH_3OH. Insets show the equivalent circuit and zoom in view of the Nyquist plot in Z' range of 0 – 220 Ω

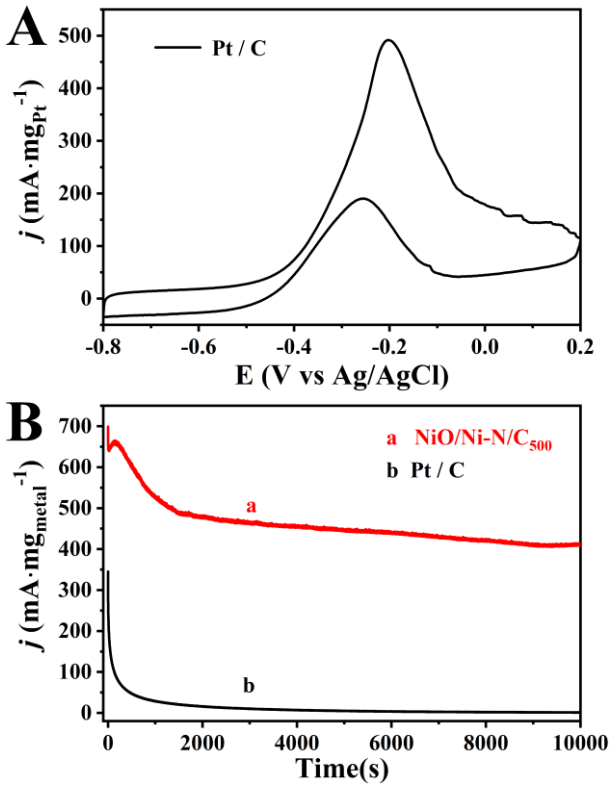

Fig. S6 (A) CV curve of the Pt/C/GCE, scan rate: 50 mV s^{-1}; (B) I-t curves for 10000s of the NiO/Ni-N/C_{500}/GCE (0.6 V vs Ag/AgCl) (a) and the Pt/C/GCE (-0.2V vs Ag/AgCl) (b). All tests were performed at 1.0 M KOH containing 3.0 M CH_3OH

Table S1 Comparison of mass activity between non-precious metal catalysts in this study and reported catalysts for MOR

Catalyst	Specific activity $mA \cdot cm^{-2}$	Mass activity $mA \cdot mg^{-1}$	CH_3OH concentration $mol \cdot L^{-1}$	Scanning rate $mV \cdot s^{-1}$	Ref.
Ni/CN	12	57	3	50	[1]
Ni-Cu/CN	1.6	5.6	3	50	[1]
$NiMoO_4$/C	49	~16.3	2	50	[2]
Cu/NiCuNWs-220/C	34.9	867.1*	1	50	[3]
Ni-Cu-P/C	9.5	–	0.5	10	[4]
Meso NiPO NS	44.97#	636	0.5	50	[5]
Ni/rGO	–	1600	1	50	[6]
$CuO/Co(OH)_2$	159	764	3	50	[7]
NiP/rGO	16.4	117	0.5	10	[8]
Pt/C	–	492*	3	50	This work
$Ni(OH)_2$/N-C	5.71	373*	3	50	This work
$NiO/Ni\text{-}N/C_{400}$	9.5	700*	3	50	This work
$NiO/Ni\text{-}N/C_{600}$	11.39	535*	3	50	This work
$NiO/Ni\text{-}N/C_{700}$	14.7	545*	3	50	This work
$NiO/Ni\text{-}N/C_{500}$	18.47	1043*	3	50	This work

(normalized by the geometric area of the electrode)

* (normalized by metal)

References

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