Supporting information

Facile and cost effective NiO/MgO-SiO_2 composites for efficient oxygen evolution reaction and asymmetric supercapacitor systems

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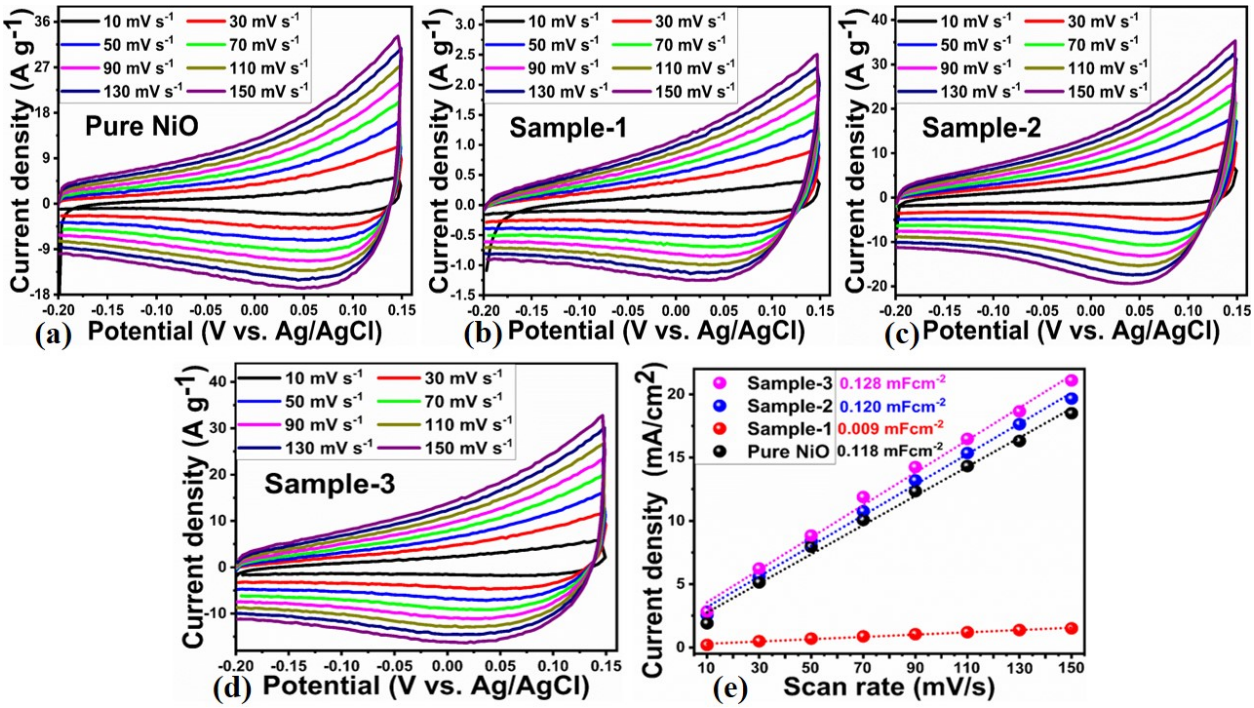

Figure (S1): Non Faradic CV curves in 1M KOH aqueous solution using different scan rates (a) pure NiO, (b) MgO-SiO_2 composites (sample1), (c,d) NiO/MgO-SiO_2 composites (sample 2and sample 3) using different scan rates in electrolytic solution of 3M KOH for the illustration of capacitance performance of each electrode material, (f) Corresponding ECSA analysis.

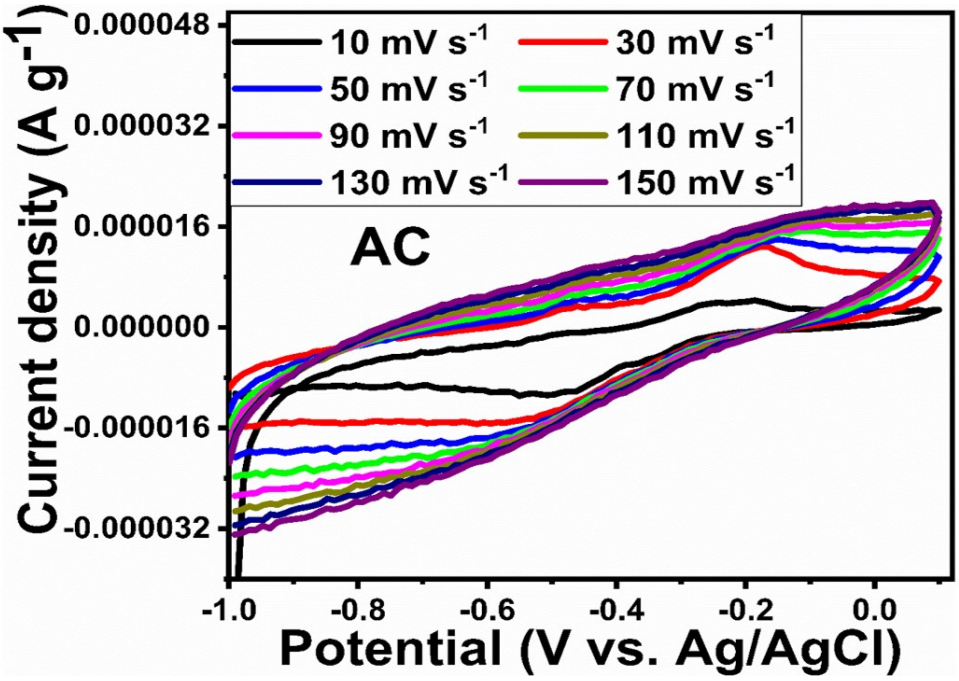

Figure (S2): Various CV curves of AC in 3M KOH electrolyte with increasing sweeping rate.

Table (S1). OER comparative study of NiO/MgO-SiO_2 composite (sample 3).

Catalyst	η for OER (mV@mA cm^{-2})	Electrolyte	References
$CuCo_2S_4/NiCo_2S_4$	271 @ 10	1.0 M KOH	[1]
Mo–Ni–Se@NF	397@ 100		[2]
NiCoFe–S/Ti	230@ 10	1.0 M KOH	[3]
$NiFe/(Ni,Fe)_3S_2$	224@10 303@400	1.0 M KOH	[4]
NiCoP/NF	280@10	1.0 M KOH	[5]

Co_3O_4@$CoMoO_4$/NF	318@20	1.0 M KOH	[6]
Co_3O_4/MgO–SiO_2	340 @10	1.0 M KOH	[7]
Co_3O_4–MgO	247@10	1.0 M KOH	[8]
MgO/Co3O4 (C-2)	270@10	1.0 M KOH	[9]
ZnO-Cr-Mg:5%	345 @10	1.0 M KOH	[10]
Sample-3	**230**	**1.0 M KOH**	**This Work**

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Table (S2). Calculated Supercapacitor parameters of synthesized samples

Sample	**Current Density (Ag^{-1})**	**Specific Capacitance (Fg^{-1})**	**Columbic Efficiency (%)**	**Capacitance Retention (%)**
Pure NiO	1.5	433.50	----------	----------
	2.5	161.76		
	3.5	123.53		
	4.5	88.62		
	5	70.33		
Sample-1	1.5	414.71	----------	----------
	2.5	140.66		
	3.5	97.57		
	4.5	82.86		
	5	66.50		
Sample-2	1.5	636.83	97.6	101.5
	2.5	258.95		
	3.5	196.04		
	4.5	92.07		
	5	72.89		
Sample-3	1.5	1248.72		
	2.5	1008.31		
	3.5	758.18		
	4.5	253.20		
	5	148.34		

Table (S3): Highlight points of ASC device.

Sample	**Current Density (Ag^{-1})**	**Specific Capacitance (Fg^{-1})**	**Energy Density ($Wh\ kg^{-1}$)**	**Power Density ($W\ kg^{-1}$)**	**Columbic Efficiency (%)**	**Capacitance Retention (%)**
Sample-2	1.5	344.12	7.31	293.25	84.6 (40000 Cycles)	88.9 (40000 Cycles)
	2.5	275.58	5.85	488.75		
	3.5	78.77	1.67	684.25		
	4.5	47.19	1.00	879.75		
	5	20.46	0.43	977.50		

Table (S4). Comparison of the specific capacitance of NiO/MgO-SiO_2 composite (sample 3) with the reported data.

Active material	Specific capacitance	Current density	Electrolyte	Ref.
$MnO_2/MnCo_2O_4$	497 F g^{-1}	0.5 A g^{-1}	2 M KOH	1
$CoMoO_4/NiMoO_4$	751 F g^{-1}	1.0 A g^{-1}	3 M KOH	2
$Co_3O_4/NiO/MnO_2$	549 F g^{-1}	0.5 A g^{-1}	6 M KOH	3
$CoMn_2O_4$	472.6 F g^{-1}	1.0 A g^{-1}	2 M KOH	4
$Co_3O_4@MnO_2$	1209.4 F g^{-1}	1.0 A g^{-1}	2 M KCl	5
$CoMoO_4@C@MnO_2$	1824 F g^{-1}	3.0 A g^{-1}	3 M KOH	6
$CuCo_2O_4@NiMoO_4$	2207 F g^{-1}	1.25 A g^{-1}	6 M KOH	7
$CdMn_2O_4@CdMn_2O_4$	3885 F g^{-1}	1.5 A g^{-1}	2 M KOH	8
$Co(OH)_2@FeCo_2O_4$	1173.43 F g^{-1}	1.0 A g^{-1}	6 M KOH	9
Chitosan-modified MgO	56.32 Fg^{-1}	0.5 Ag^{-1}	3 M KOH	10
$NiCo@Si_1$-C	518.1 F g^{-1}	0.5 A g^{-1}	3 M KOH	11
RH-SiO_2	102 F/g	0.5 A/g	2 M KOH	12
SiO_2-$NiFe_2O_4$	800.8 F g^{-1}	1 A g^{-1}	3 M KOH	13
rGO/n-SiO2	166.9 F g	0.1 A g–1	1M H_2SO_4	14
Sample-3	1248.72 F g^{-1}	1.5**A g^{-1}**	**3 M KOH**	**Present work**

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