One step synthesis of $Ni/Ni(OH)_2$ nano sheets (NSs) and their application in asymmetric supercapacitors

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Instruments used.

The synthesized Ni/ $Ni(OH)_2$ and $NiO/Ni(OH)_2$ NSs were characterized using several spectroscopic techniques as follows. The transmission electron microscopy (TEM) analysis was done with a Tecnai model TEM instrument (Tecnai^{TM} G2 F20, FEI) with an accelerating voltage of 200 KV. The X-ray diffraction (XRD) analysis was done using a PAN analytical Advanced Bragg-Brentano X-ray powder diffractometer (XRD) with Cu $K_\alpha$radiation (λ = 0.154178 nm) with a scanning rate of 0.020 s^{-1} in the 2θ range 10-90°. The X-ray photoelectron spectroscopic (XPS) analysis was done to check the chemical composition and the state of elements present in the outermost part of materials and analyzed by using Theta Probe AR-XPS System, Thermo Fisher Scientific (U.K). BET surface area measurement done using Quantachrome NovaWin - Data Acquisition and Reduction for NOVA instruments ©1994-2012, Quantachrome Instruments version 11.02. All the electrochemical experiments were examined using an CHI 6304C electrochemical work station in 1 M KOH aqueous solution.

Preparation of sample various other characterizations.

The $Ni/Ni(OH)_2$ and $NiO/Ni(OH)_2$NSs were characterized using XRD,TEM, and XPS. The samples for TEM were prepared by placing a drop of the diluted NS solution onto a carbon coated Cu grid followed by slow evaporation of solvent at ambient conditions. For

XRD and XPS, the prepared powder samples (after dried at 60 °C) were directly used for the measurements. The fabrication of electrode for supercapacitor studies was described in the main text.

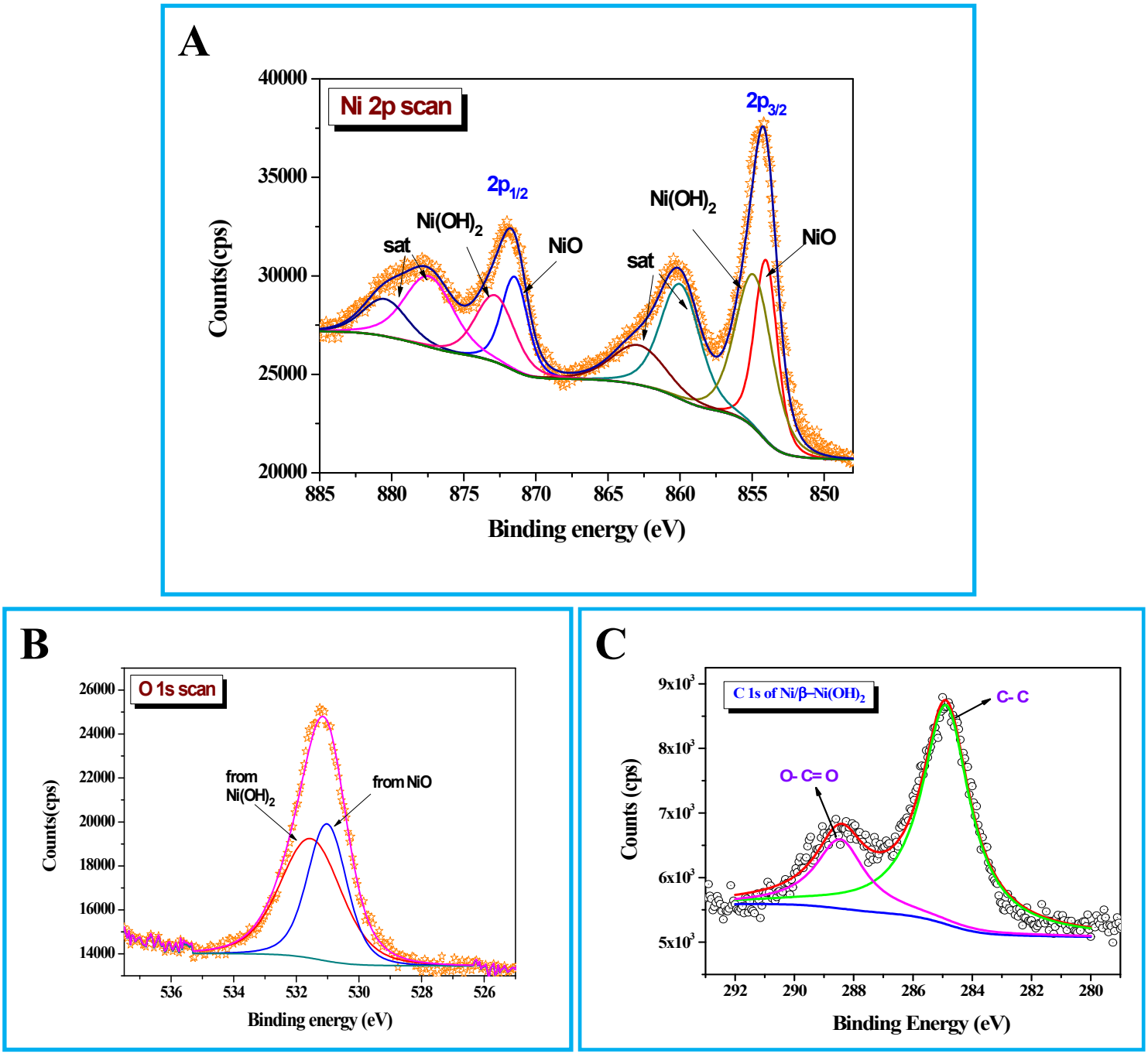

Figure S1: (A) XPS of Ni 2p state of Ni present in NiO/$Ni(OH)_2$ NSs. (B) XPS of O1s state of O present in NiO/$Ni(OH)_2$NSs (C) XPS of C 1s state of C present in Ni/$Ni(OH)_2$ NSs.

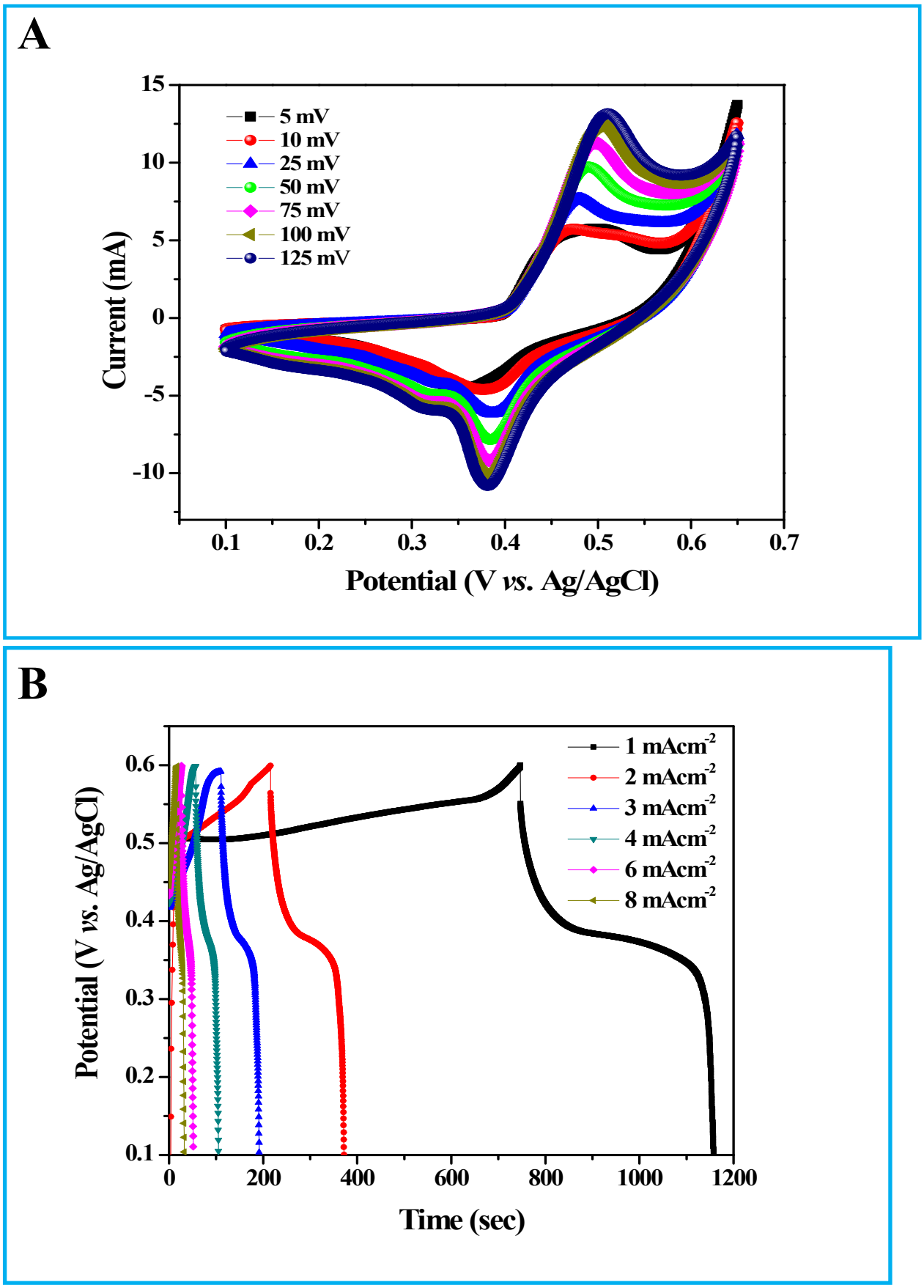

Figure S2: (A) CV curves of $NiO/Ni(OH)_2$ NS electrode at various scan rates; (B) Galvanostatic charge/discharge (GCD) curves of $NiO/Ni(OH)_2$ NSs at various current densities.

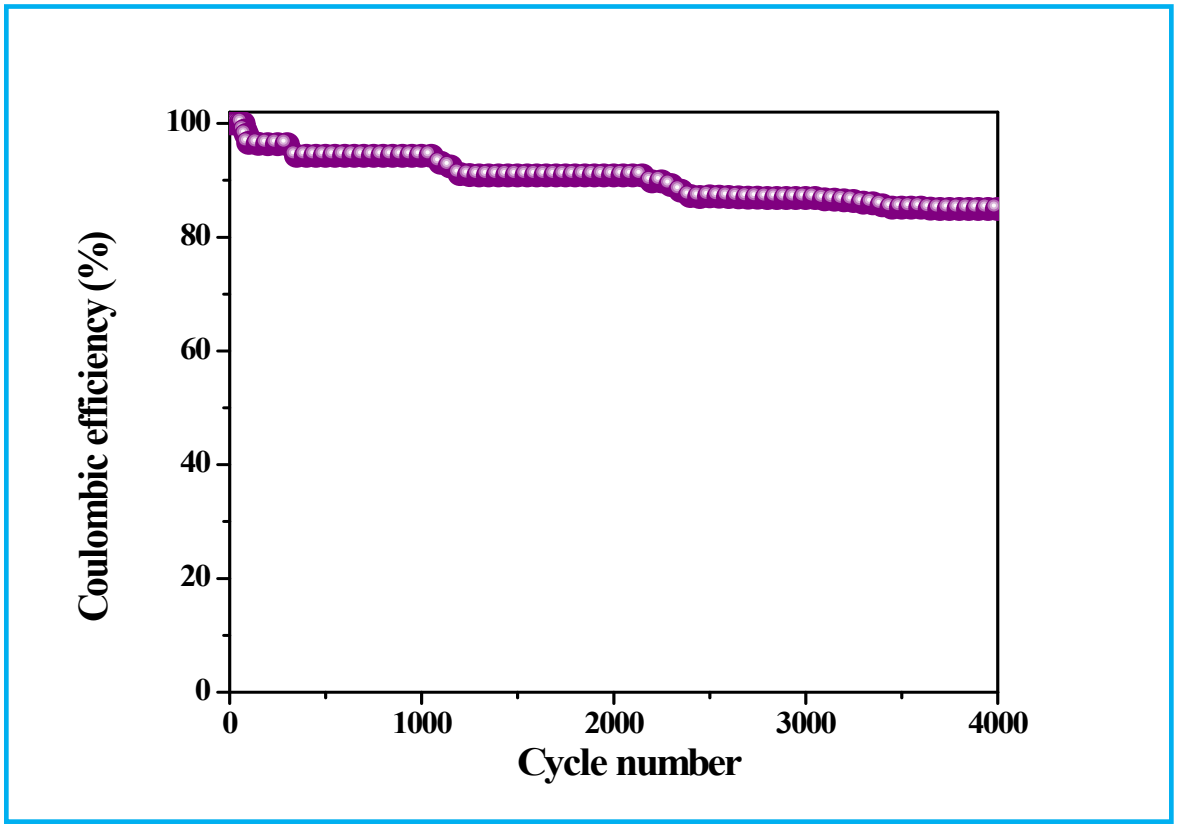

Figure S3: Coulombic efficiency of $Ni/Ni(OH)_2$ NSs electrode at 15 mA cm^{-2} for 4000 cycles

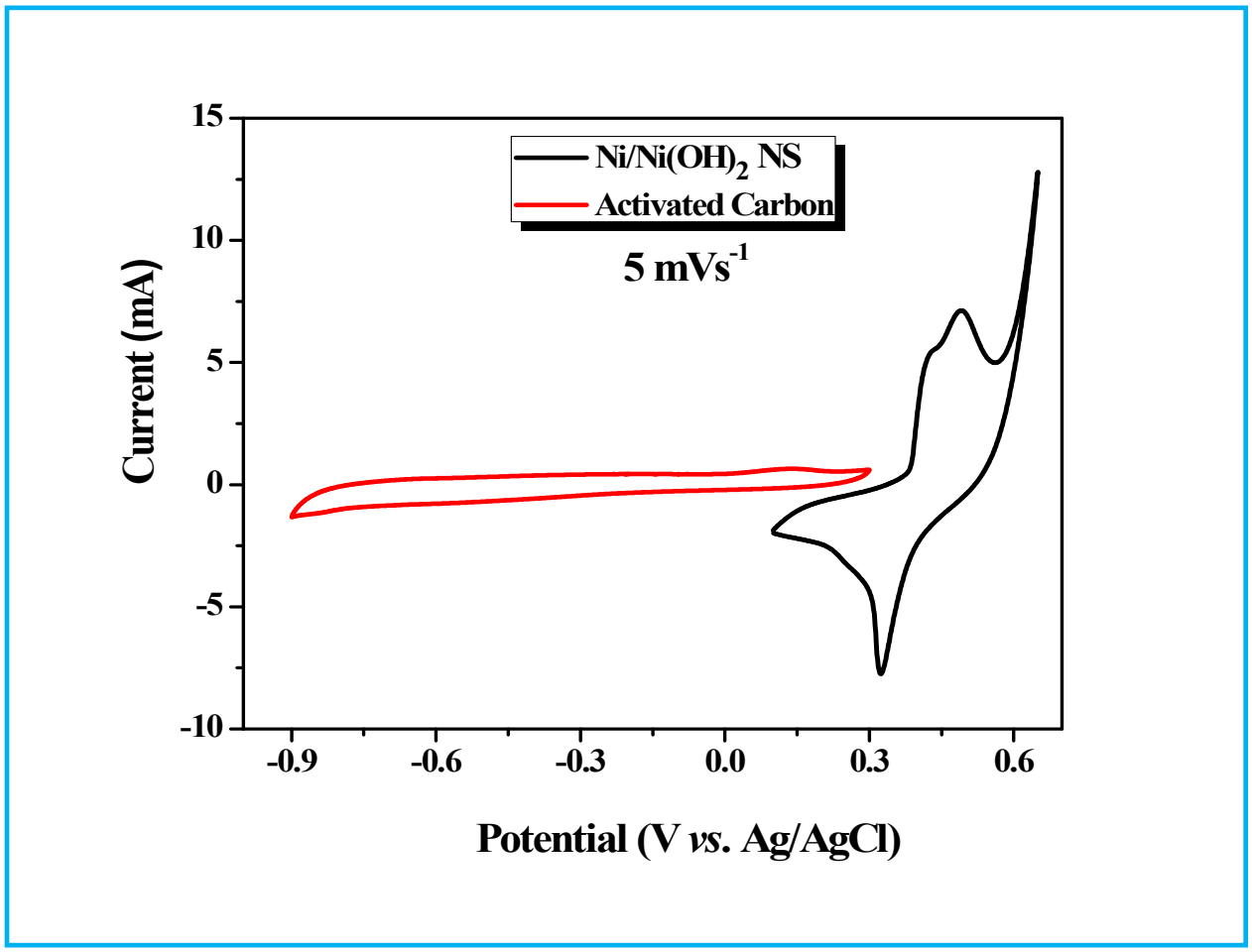

Figure S4: CV curves of activated carbon (AC) and $Ni/Ni(OH)_2$ NSs in 1M KOH at scan rat of 5 mVs^{-1}

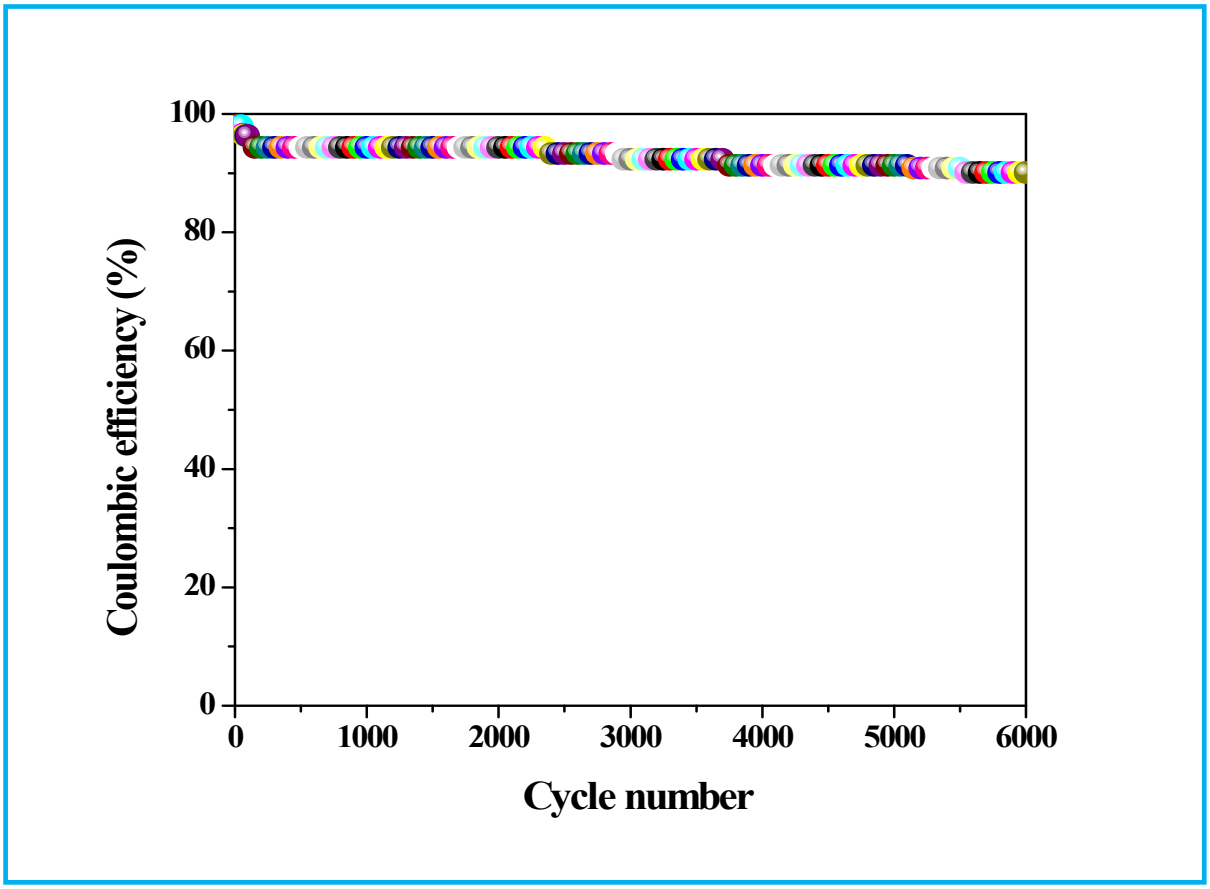

Figure S5: Coulombic efficiency of ASC cell for 6000 cycles.

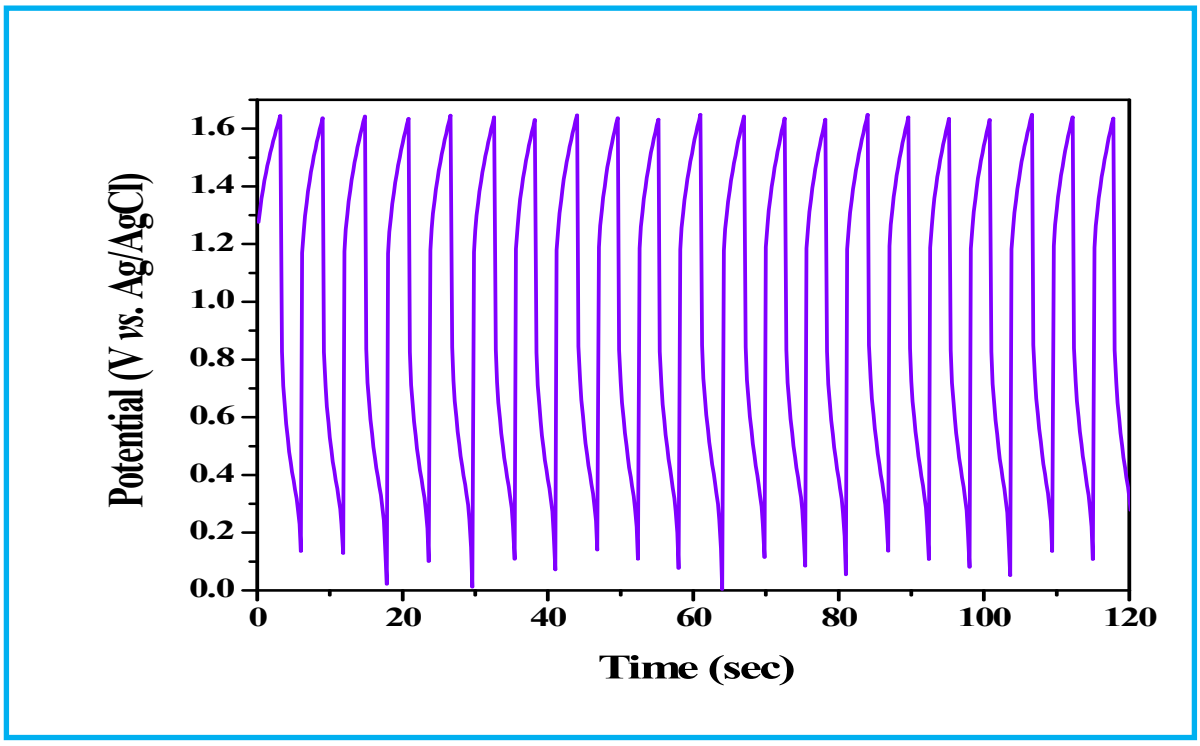

Figure S6: First 20 cycles of 6000 cycles of ASC cell.

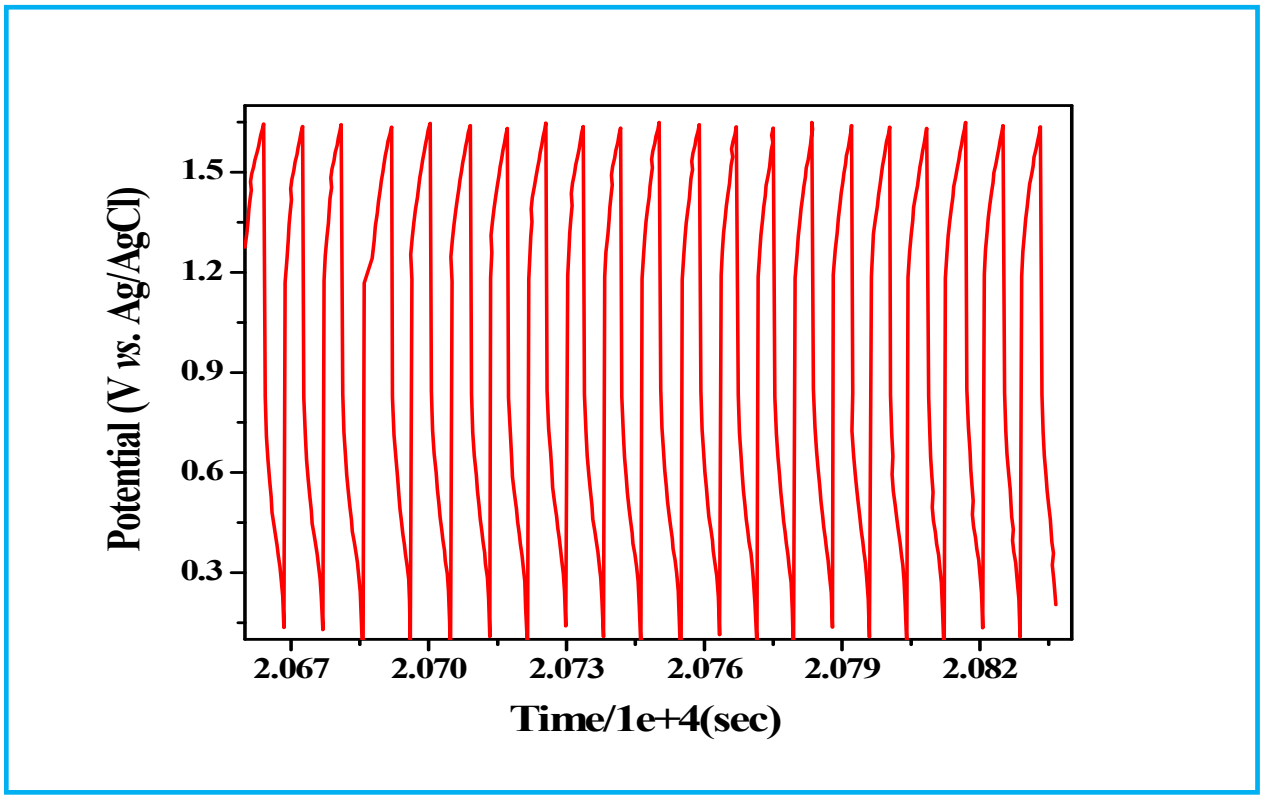

Figure S7: Middle 20 cycles of 6000 cycles of ASC cell.

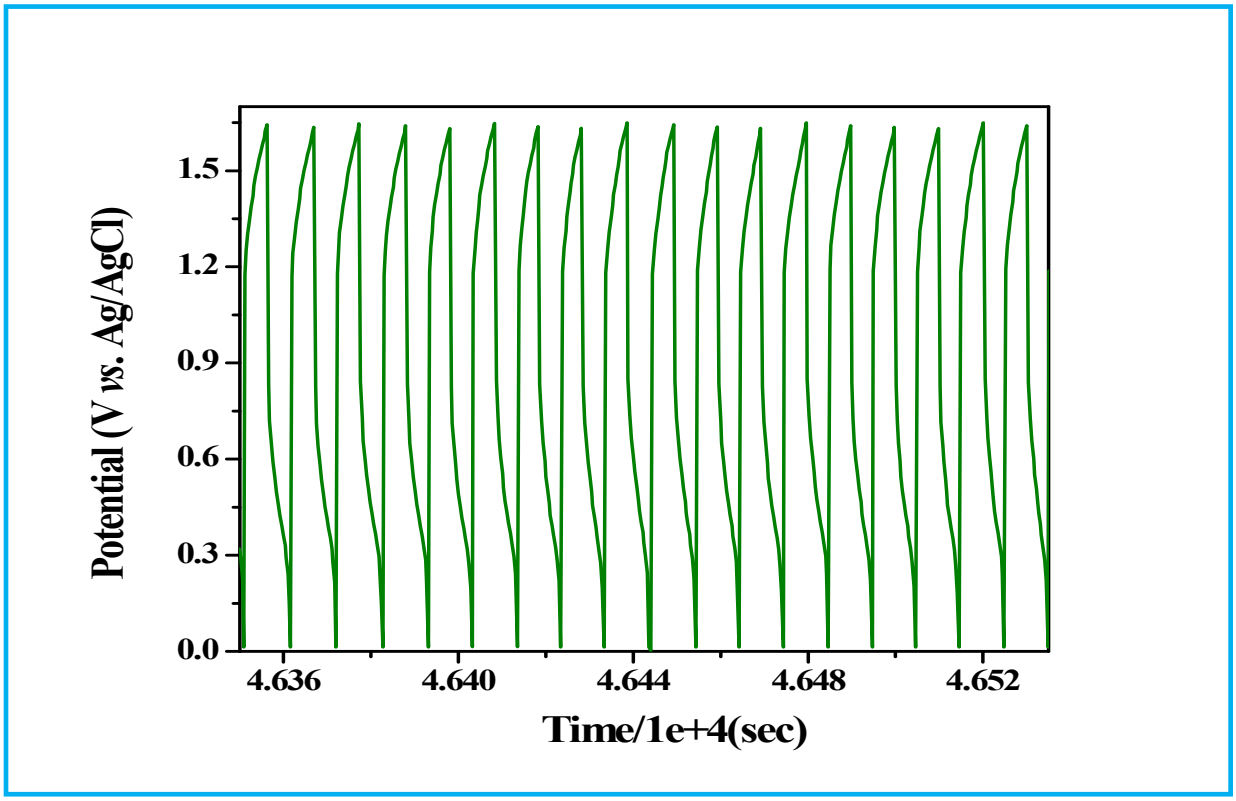

Figure S8: Final 20 cycles of 6000 cycles of ASC cell.

Scan rate (mVs^{-1})	Specific capacitance of $Ni/Ni(OH)_2$ NS (Fg^{-1})	Specific capacitance of $NiO/Ni(OH)_2$ NS (Fg^{-1})
5	536	440
10	300	215
25	156	101
50	97	58
75	72	43
100	57	35
125	47	30

Table S1: Specific capacitance comparison between $Ni/Ni(OH)_2$ and $NiO/Ni(OH)_2$ at various scan rates.

Current density ($mAcm^{-2}$)	Specific capacitance of $Ni/Ni(OH)_2$ NS (Fg^{-1})	Specific capacitance of $NiO/Ni(OH)_2$ NS (Fg^{-1})
1	450	343
2	323	260
3	257	202.5
4	213	156.6
6	160	125
8	133	120

Table S2: Specific capacitance comparison between $Ni/Ni(OH)_2$ and $NiO/Ni(OH)_2$ at various scan rates.