

## **Supporting Information**

# **Solution Processed NiO/MoS<sub>2</sub> Heterostructure Nanocomposite for Supercapacitor Electrode Application**

**Dhivyaprasath Kasinathan <sup>1</sup>, Praveena Prabhakar <sup>1</sup>, Preethi Muruganandam <sup>1</sup>, Biny R. Wiston <sup>1</sup>, Ashok Mahalingam <sup>1,\*</sup> and Ganesan Sriram <sup>2,\*</sup>**

<sup>1</sup> New Generation Materials Laboratory, Department of Physics, National Institute of Technology

<sup>2</sup> School of Chemical Engineering, Yeungnam University, Gyeongsan 38541, Republic of Korea

\* Correspondence: ashokm@nitt.edu (A.M.); sriramyu@yu.ac.kr (G.S.)

## Elemental analysis

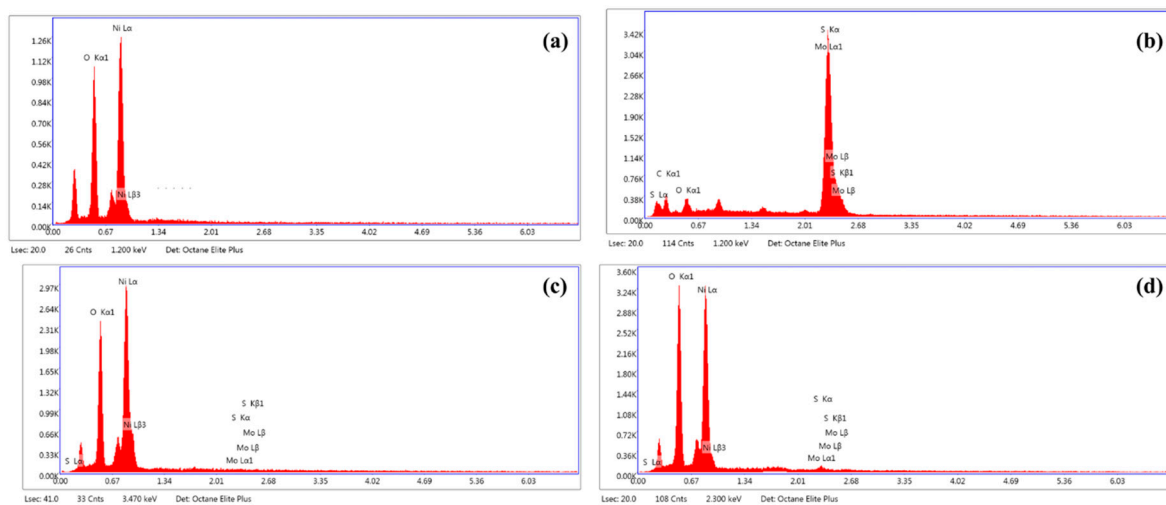


Figure S1. (a-d) EDAX energy spectrum of N, M, NM3, and NM10

Table S1. Specific capacitance of N, M, NM3, NM10 and NM15 samples at 5 mV/s Scan rate from CV

Sample	Area (AV)	Scan rate (mV/S)	Mass(g)	Potential window (V)	Specific capacitance (F/g)
M	0.000233081	5	0.0008	0.65	44.82326047
N	0.00035899	5	0.0012	0.65	46.02435029
NM3	0.000831394	5	0.0011	0.65	116.2789189
NM10	0.001712972	5	0.0013	0.65	202.7185484

Table S2. Specific capacitance calculated from GCD techniques

Sample	Current density(A/g)	Potential (V)	Discharge time (s)	Specific capacitance (F/g)
N	0.5	0.57	56.8	99.64912281
M	0.5	0.55	73.8	134.1818182
NM3	0.5	0.57	160.1	280.877193
NM10	0.5	0.57	339.8	596.1403509

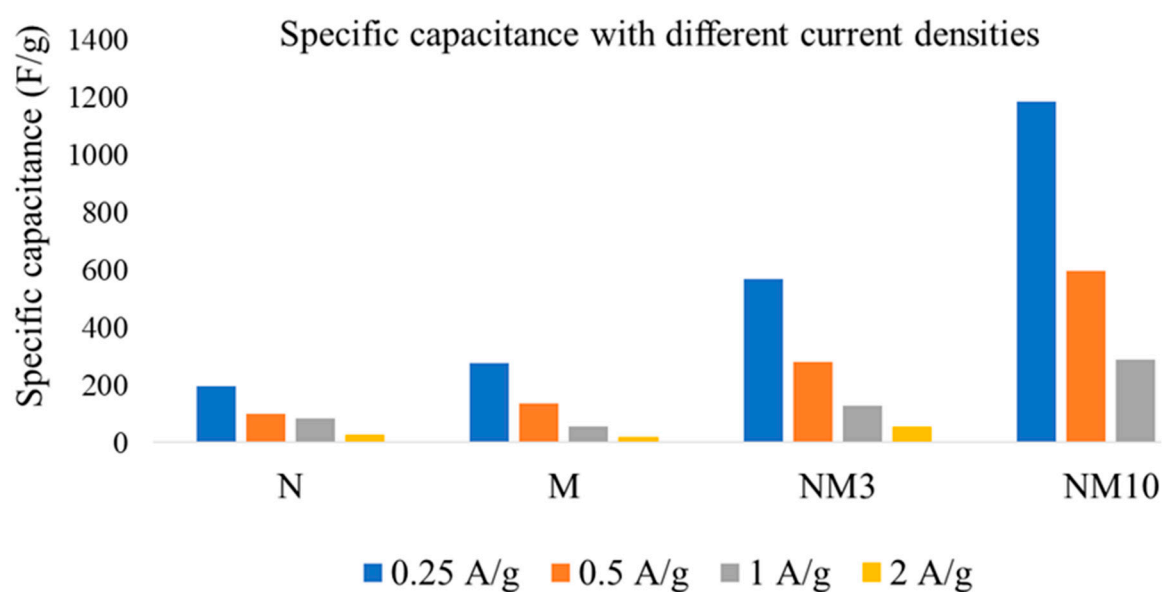


Figure S2. GCD specific capacitance for different energy density

Table S3. Elemental composition of samples.

Sample/Element	Ni	O	Mo	S
N	44.70	55.30	Nil	Nil
M	29.15	70.85	Nil	Nil
NM3	44.46	55.40	0.12	0.2
NM10	36.13	61.88	1.26	0.73

### Thermogravimetric Analysis

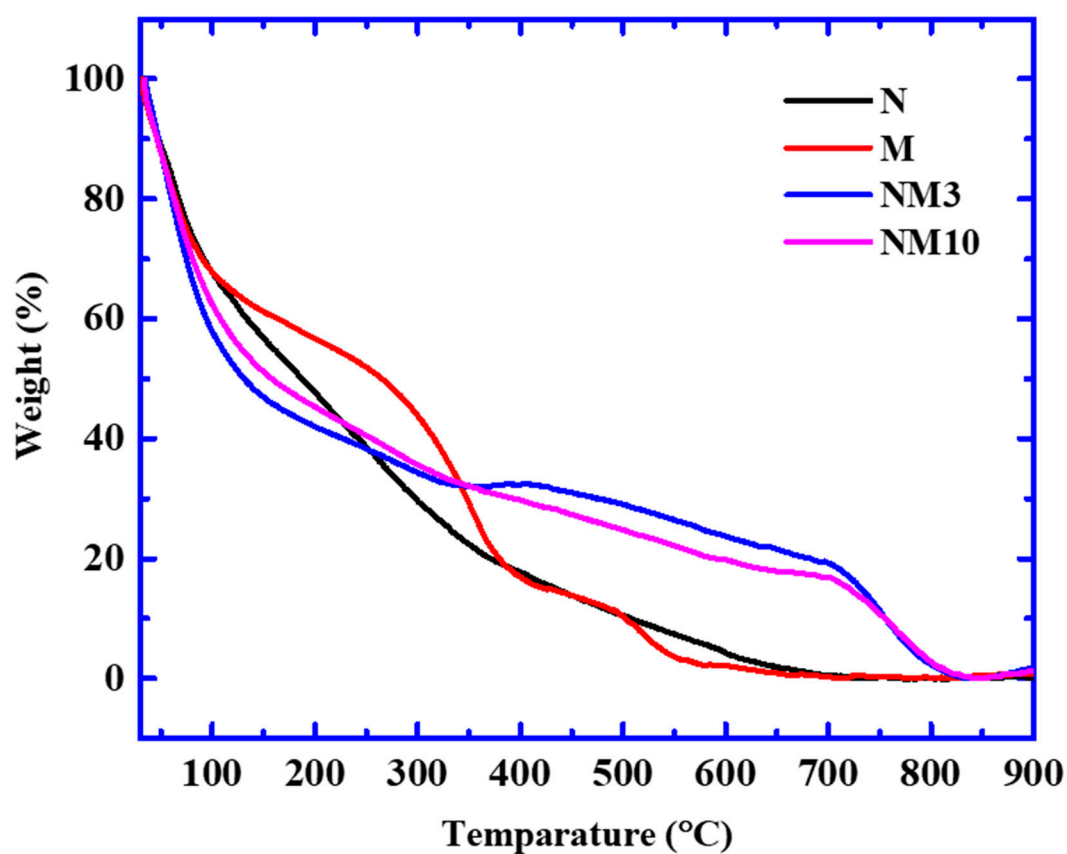


Figure S3. TGA of N, M, NM3 and NM10

Thermal weight loss observation of the prepared materials was studied using TGA shown in fig. 6. The pristine samples N and M has unique weight loss

temperatures and composites NM3 and NM10 has mixed properties of both pristine materials NiO and MoS<sub>2</sub>. In detailed, N has three weight losing temperature and up to 120°C due to dehydration process. Sample M has three parts around 370°C due to the sulphur reaction, mass loss 400-560°C attributable to by the reaction of carbon the finally mass loss above 600°C due to MoO<sub>3</sub> sublimation. For the composites NM3 and NM10 has high thermal stability due to the composite effect.

#### *Symmetric supercapacitor device performance*

The symmetric supercapacitor (quasi-solid-state) device was fabricated with our best electrode material NM10, and their performance was tested using glowing light emitting diode (LED). The device electrode was six identical electrodes with material load ~1.2, then the cellulose paper soddens in 1M KOH for 24h. The separator sandwiched between two electrodes and packed tightly. The distinct devices are fabricated and connected in the series. The fabricated device shown in Fig. S4. The device was charged with 9V battery for 30 s and connected with Red LED. The light glowing for ~40 s.

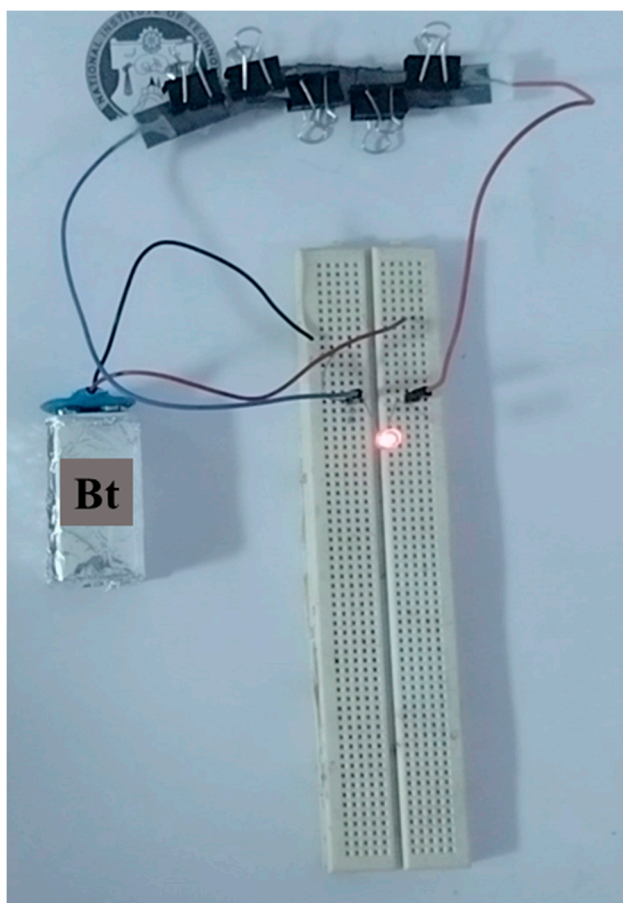


Figure S4. Photograph of lab scale supercapacitor device