

Supporting Information

Binder Free 2D Aligned Efficient MnO₂ Micro Flower as Stable Electrodes for Symmetric Supercapacitor Applications

Anil A. Kashale^{a,c}, Madagonda M. Vadiyar^b, Sanjay S. Kolekar^b, Bhaskar R. Sathe^c, Jia-Yaw Chang^{d*}, Hom N. Dhakal^e, and Anil V. Ghule^{a,b,*}

^aDepartment of Nanotechnology, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad 431004, Maharashtra, India.

^bDepartment of Chemistry, Shivaji University, Kolhapur 416004, Maharashtra, India
Email: anighule@gmail.com, avg_chem@unishivaji.ac.in

^cDepartment of Chemistry, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad 431004, Maharashtra, India

^dDepartment of Chemical Engineering, National Taiwan University of Science and Technology, Taipei 10607, Taiwan.

Email: jychang@mail.nthust.edu.tw

^eSchool of Engineering, University of Portsmouth, Hampshire PO1 3DJ, United Kingdom

Tables and Figure Captions

Fig. S1 Representative XRD spectrum of MnO₂ powder.

Fig. S2 Representative XRD spectrum of SSM substrate.

Fig. S3 (a-c) Cyclic voltammograms of M1, M2, and M3 samples at different scan rate from 10 to 100 mV s⁻¹ (d-e) Galvanostatic charge-discharge curves of M1, M2 and M3 samples at different current densities from 5 to 20 mA cm⁻².

Fig. S4 Representative Nyquist plot of SSM/M1//M1/SSM symmetric device before and after 2500 cycles.

Table S1. The electrochemical performance values of all the MnO₂ supercapacitor.

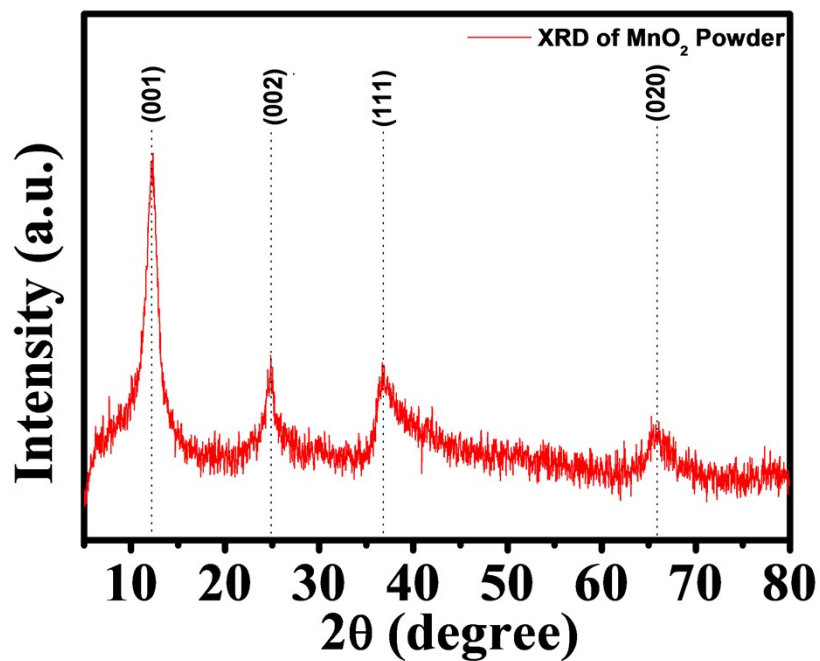


Fig. S1 Representative XRD spectrum of MnO₂ powder.

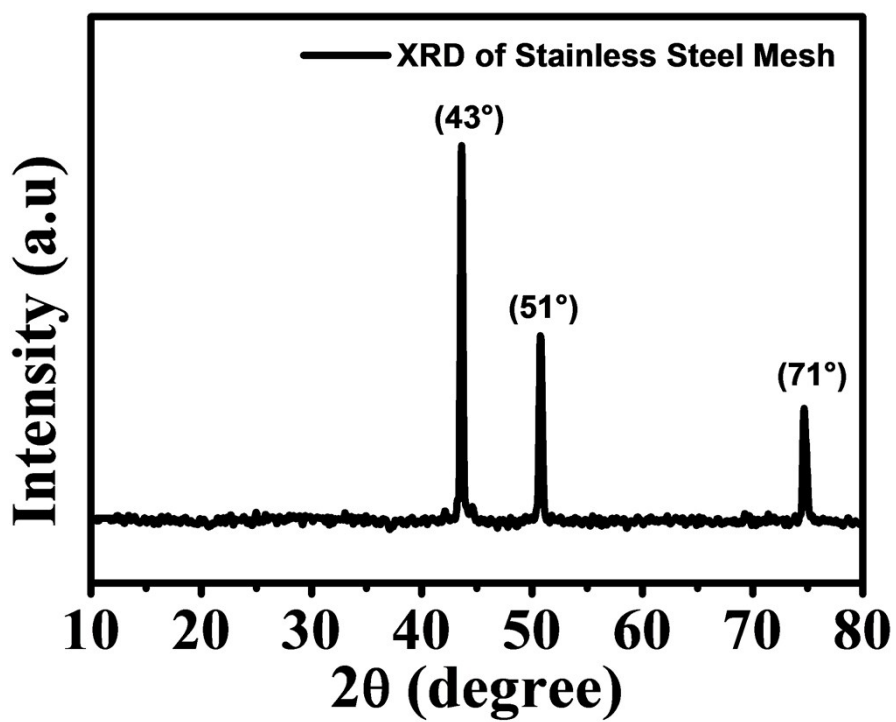


Fig. S2 Representative XRD spectrum of SSM substrate.

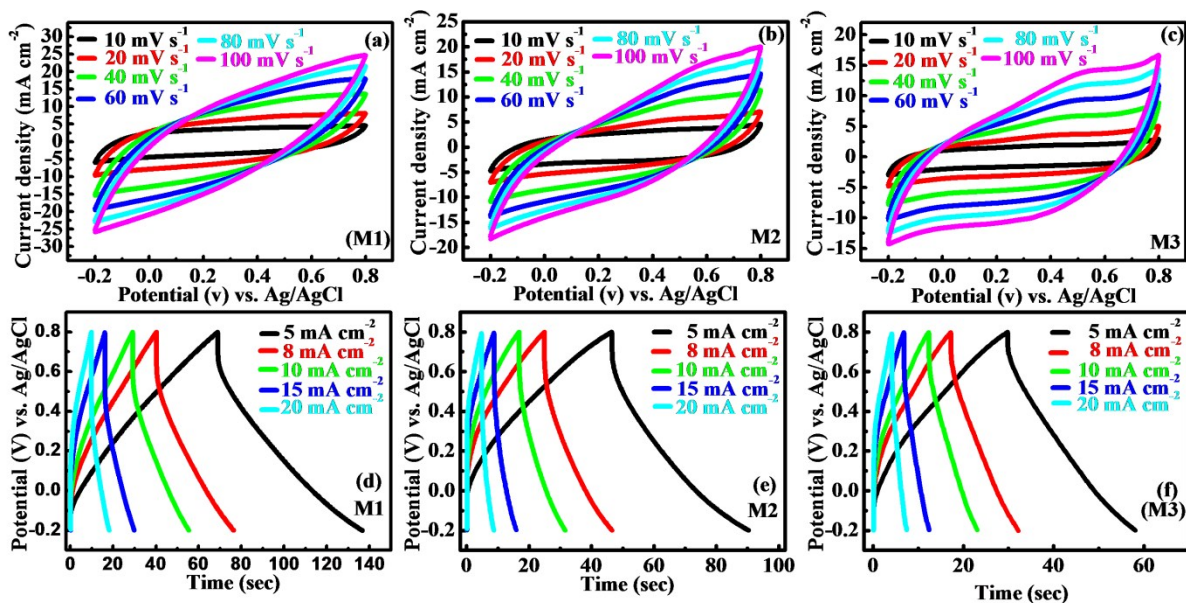


Fig. S3 (a-c) Cyclic voltammograms of M1, M2, and M3 samples at different scan rate from 10 to 100 mV s⁻¹ (d-e) Galvanostatic charge-discharge curves of M1, M2 and M3 samples at different current densities from 5 to 20 mA cm⁻².

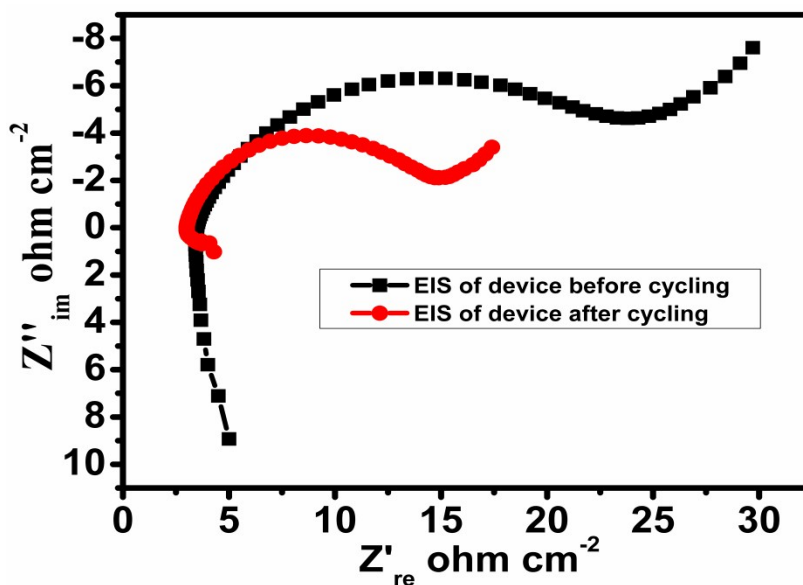


Fig. S4 Representative Nyquist plot of SSM/M1//M1/SSM symmetric device before and after 2500 cycles.

Table S1. The electrochemical performance values of all the MnO₂ supercapacitor.

Materials	Current Density (mA cm⁻²)	Specific Capacitance (F g⁻¹)	Energy Density (Wh kg⁻¹)	Power Density (kW kg⁻¹)
M1	5	376	52	2.7
	8	321	44	4.4
	10	292	40	5.5
	15	230	32	8.3
	20	184	25	11.1
M2	5	312	43	3.5
	8	259	36	5.7
	10	225	31	7.1
	15	173	24	10.7
	20	140	19	14.2
M3	5	283	39	5.0
	8	240	33	8.0
	10	216	30	10.0
	15	168	23	15.0
	20	132	18	20.0