Supporting Information

Silicon-nanoforest-based Solvent-free Micro-supercapacitor with Ultrahigh Spatial Resolution via IC-compatible *In-situ* Fabrication for On-chip Energy Storage

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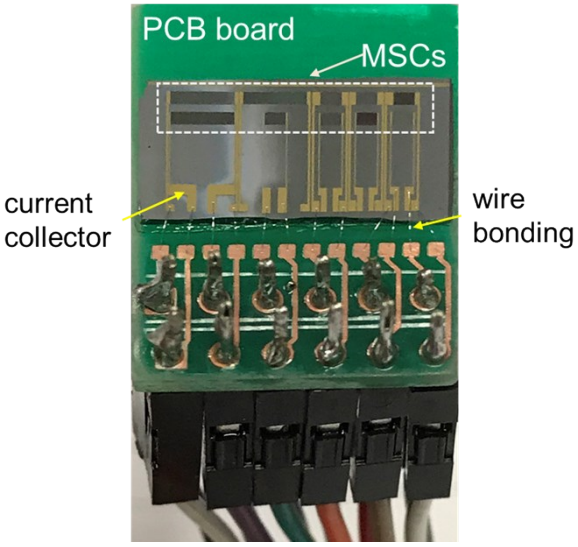

Figure S1. A home-made solid-state on-chip SNNF-MSC test setup.

Measurement setup: One batch of MSCs were cut from a Si wafer with about 500 samples and assembled with a home-built PCB board (green colour), as shown in Figure S1. The current collectors of each MSCs were connected to the PCB board conducting pads through the wire-bonding method. After welding, the MSCs were successfully connected with the corresponding external circuit for testing.

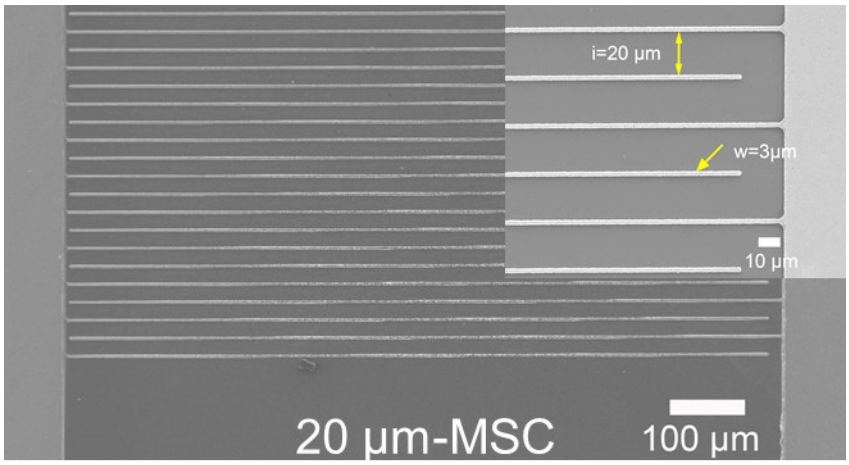

Figure S2. Top-view SEM image of 20 μm MSC

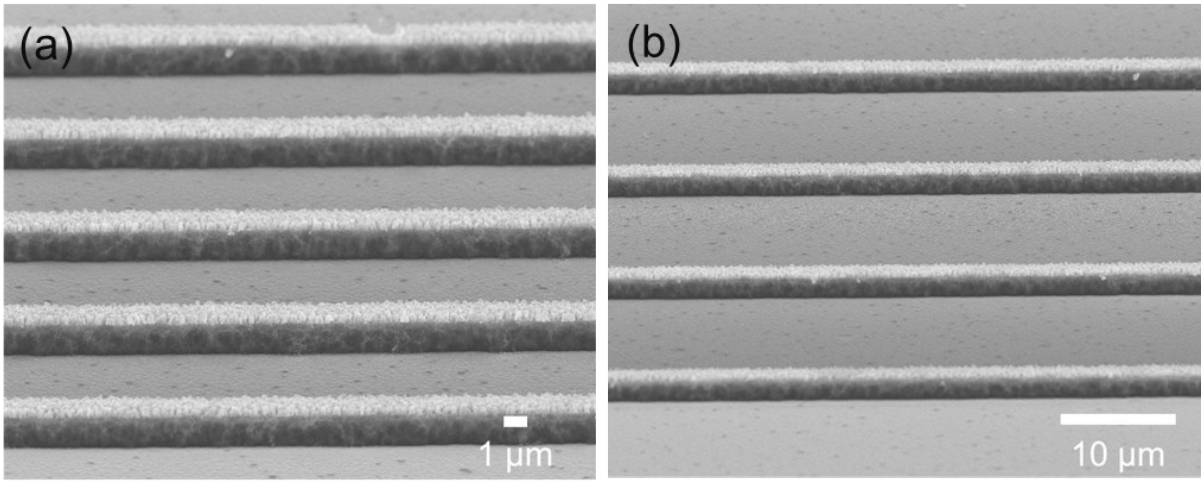

Figure S3. 45-degree-view SEM images of silicon-pillar nanoforest structure of (a) 10-μm-MSC and (b) 20-μm-MSC on a silicon chip.

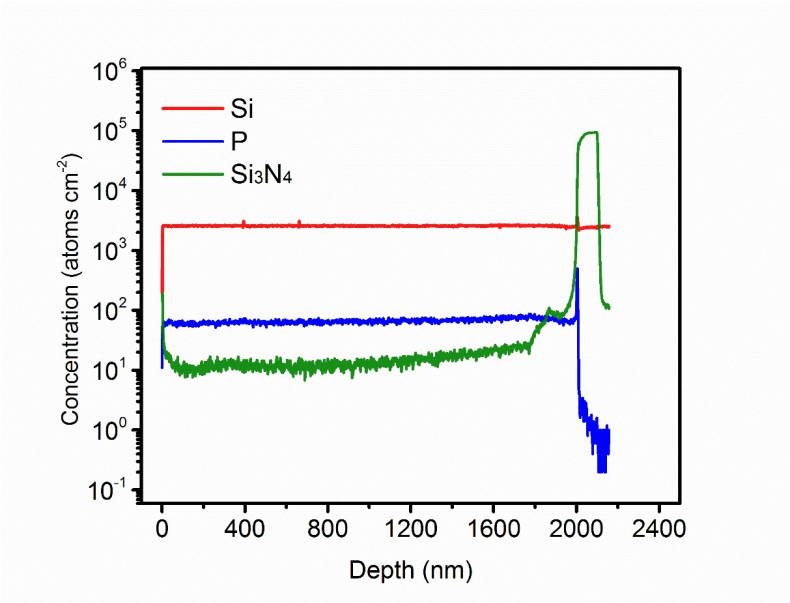

Figure S4. SIMS measurement result of phosphorus-doped n-type silicon.

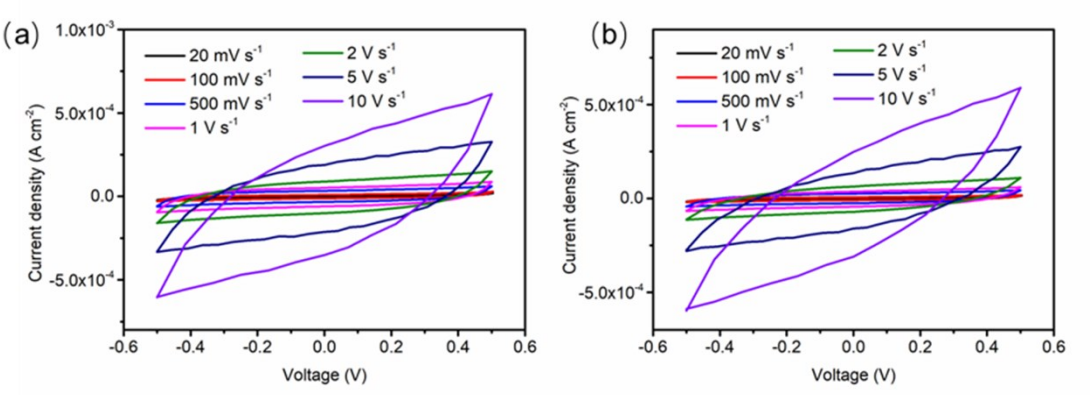

Figure S5. CV curves of (a) 10µm-MSCs and (b) 20 µm-MSCs at various scan rates 20 mV s^{-1} to 10 V s^{-1}.

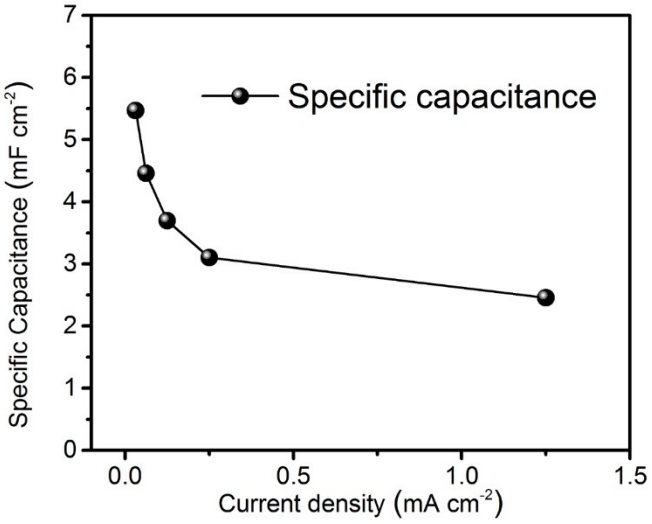

Figure S6. The specific capacitance of 5-µm-MSC at various charge-discharge current densities from 0.03 mA cm^{-2} to 1.25 mA cm^{-2}.

Table S1. Comparison of the spatial resolution and responding performance with recent MSCs made by different techniques.

Electrode	Method	Width /μm	Gap /μm	Time constant /ms	Capacitance /mF cm^{-2}	Energy density/ mWh cm^{-3}	Power density/ W cm^{-3}	Ref.
rGO/Au	Laser written	140	60	2.76	0.77 @ 1V s^{-1}	/	/	1
LSG-MSC	Laser-scribed	~20	~20	19	2.32 @ 16.8 mA cm^{-3}	0.3	10	2
Ti3C2Tx Mxene	Laser cutting	1800	284	/	0.47 @ 1.0 μA cm^{-2}	0.53	11.96	3
Mxene	Laser cutting	109.2	598.6	/	19.6 @ 20 mV s^{-1}	18	0.7	4
Activated carbon	Jet printing	~10	<50	/	0.127 @ 1 mV s^{-1}	/	/	5
Graphene	Inkjet printing	600	300	2000	0.14 @ 5 mV s^{-1}	/	/	6
Si/TiC/CDC	Photolithography	100	15	/	400 F cm^{-3} @ 1 mV s^{-1}	9 μWh cm^{-2}	0.5 W cm^{-2}	7
PEDOT/Au	Photolithography	100	50	10	9 @ 35 μA cm^{-2}	7.7	0.8	8
MnOx/Au	Photolithography	100	100	5	32.8 F cm^{-3}	1.75	3.4	9
Si	Photolithography	200	200	/	0.013 @ 100 mV s^{-1}	/	/	10
Si/Ni	Photolithography	3	5	1.09	0.238 @ 1.25 mA cm^{-2}	0.15	4.15	**This work**

References

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