Facile fabrication of well-defined polyaniline microtubes derived from natural kapok fiber for supercapacitor with long-term cycling stability

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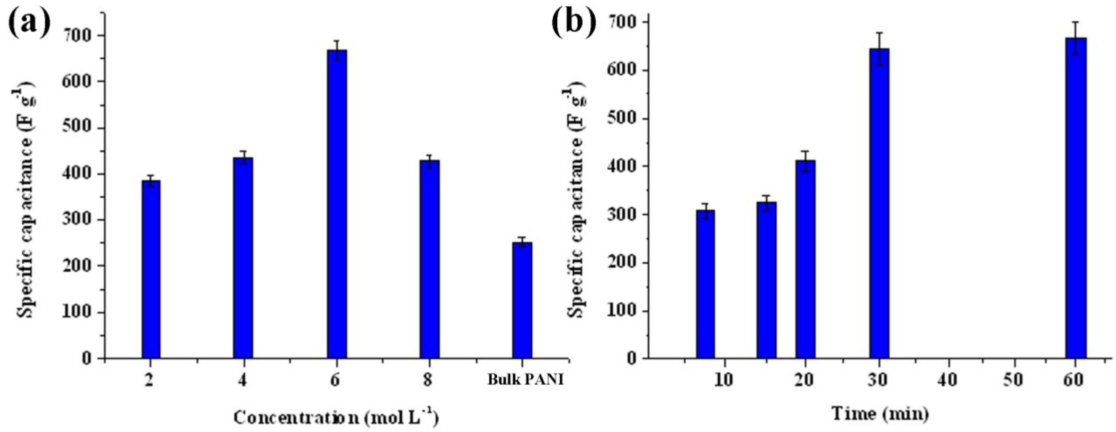

Fig. S1 The specific capacitance of bulk PANI and PANI microtubes prepared using different concentration of NaOH solution for 60 min (a), and (b) 6.0 M NaOH solution for different etching time.

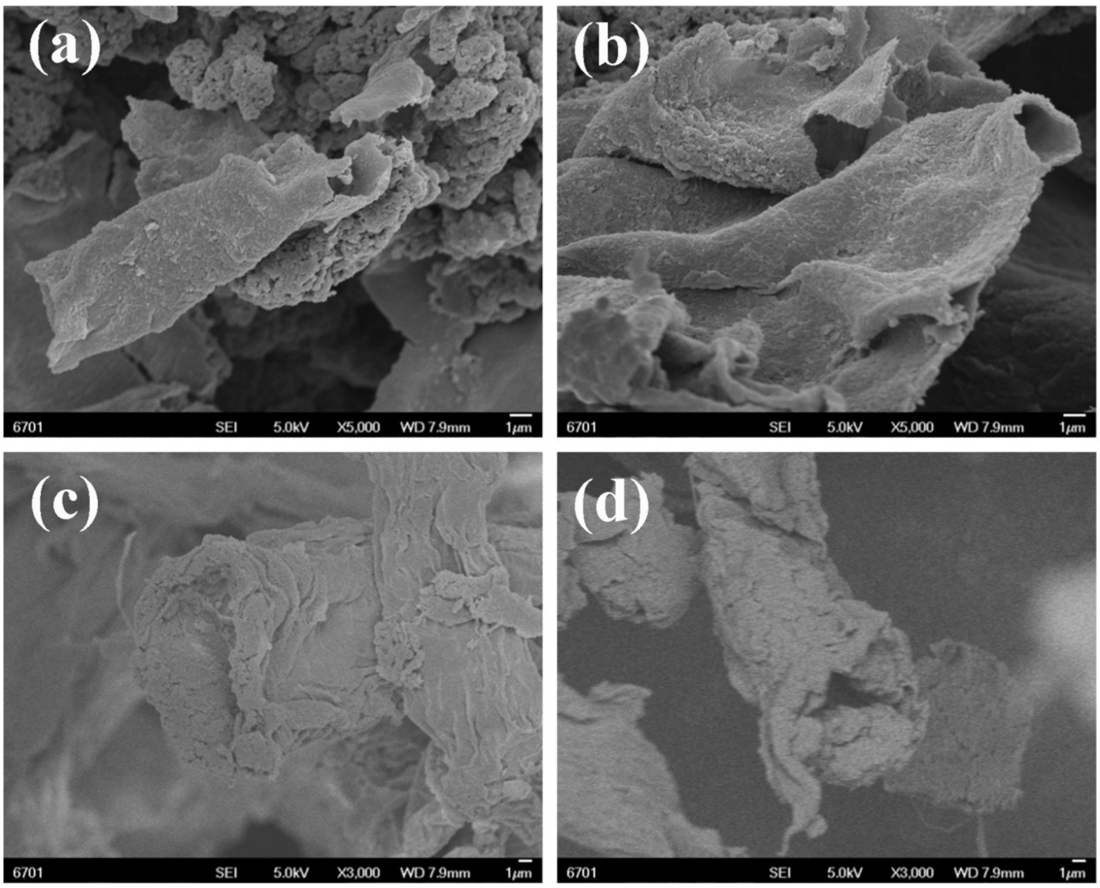

Fig. S2 SEM images of PANI microtubes prepared using NaOH solution with different concentrations of (a) 2.0 M, (b) 4.0 M, (c) 6.0 M and (d) 8.0 M.

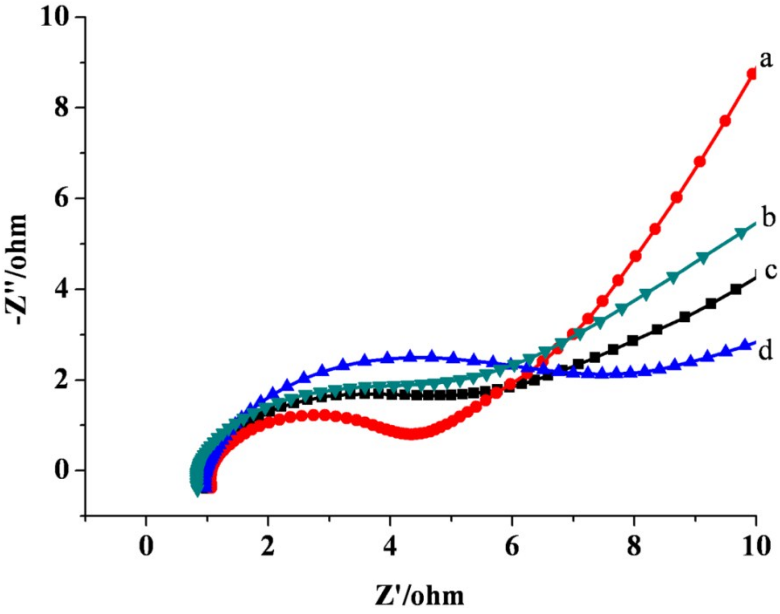

Fig. S3 EIS spectra of PANI microtubes prepared using different concentrations of NaOH solution for 60 min: (a) 2.0 M, (b) 4.0 M, (c) 6.0 M and (d) 8.0 M.

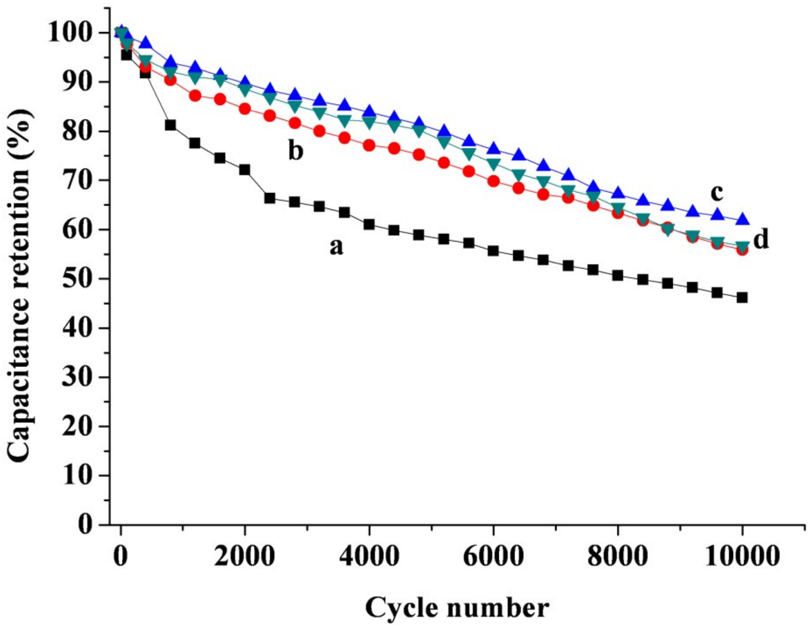

Fig. S4 Cycle stability of PANI microtubes prepared using different concentrations of NaOH solution for 60 min: (a) 2.0 M, (b) 4.0 M, (c) 6.0 M and (d) 8.0 M.

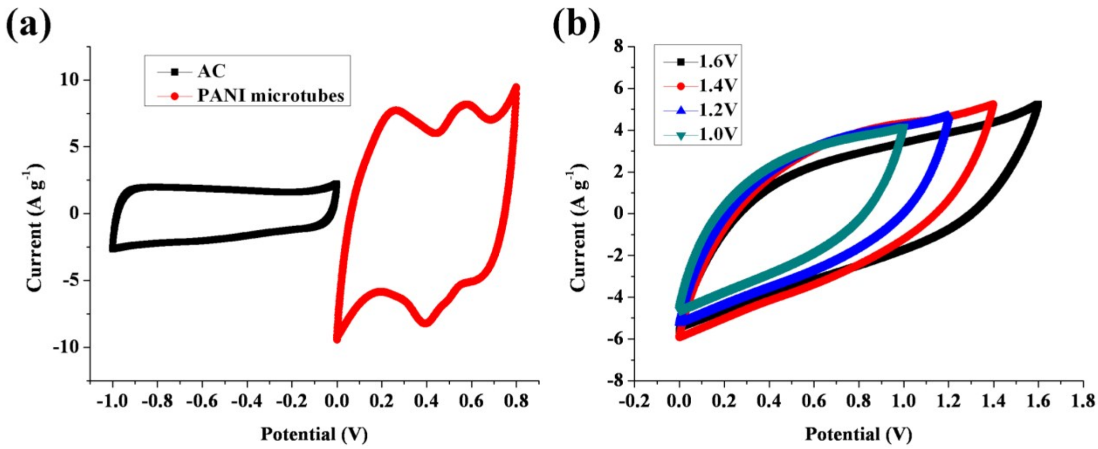

Fig. S5 CV curves of the negative (AC) and positive (PANI microtubes) electrodes in a three-electrode configuration at a scan rate of 10 mV s^{-1} and (b) CV curves of the PANI microtubes//AC asymmetric supercapacitor at a scan rate of 100 mV s^{-1} within different potential windows in 1.0 M H_2SO_4.

Table S1 Comparison of the diameter and the cycling stability of various micro/nanostructured PANI materials.

Morphology	Diameter	Template	Max capacitance	Retention(cycles)	Ref
Nanofibers	400-550nm	PAA	601	62%(500)	1
Nanotube	400nm	ZnO	650	65%(400)	2
Nanowire	50nm	Free	950	88%(500)	3
Nanowires	30-60nm	Free	775	90%(1500)	4
Nanofibers	100nm	Free	278	53%(2000)	5
Nanofibers	200nm	Free	267	86%(1000)	6
Nanotubes	100nm	MnO_2	533	65%(1000)	7
Nanofibers	110nm	PPD	548	75%(1000)	8
Irregular	-	Free	323	89%(1300)	9
Nanorods	50nm	Free	455	65%(1300)	10
Particles	100nm	Free	358	95%(1000)	11
Nanofibers	50-100nm	SA	2093	74%(1000)	12
Nanorods	150nm	Free	658	65%(250)	13
Nanotubes	80nm	MnO_2	661	63%(1000)	14
Nanotubes	100nm	MnO_2	896	57%(6000)	15
Nanobelts	2μm	Free	873	96%(1000)	16
Nanorods	1-2μm	Free	757	90%(1000)	17
Nanofibers	70-100nm	Free	480	75%(1000)	18
Microtube	20-25μm	KF	667	60%(10000)	This

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Table S2 Comparison of energy density (ED) and power density (PD) of supercapacitor based on various micro/nano-structured PANI materials.

Material	Electrolyte	ED[a]	PD[b]	Ref
Polyaniline nanofibers	1 M HCl	9.4 Wh kg^{-1}	436W kg^{-1}	1
Polyaniline nanotubes	1 M H_2SO_4	8.7 Wh kg^{-1}	289 KW kg^{-1}	2
Polyaniline powder	1 M LiPF6	14.8 Wh kg^{-1}	48W kg^{-1}	3
Graphene/Polyaniline Nanofiber	1 M HCl	18.5 Wh kg^{-1}	100W kg^{-1}	4
Polyaniline-MnO_2 nanotube	1 M H_2SO_4	17.8 Wh kg^{-1}	600W kg^{-1}	5
Graphene-mesoporous polyaniline	1 M H_2SO_4	11.3 Wh kg^{-1}	107W kg^{-1}	6
Polyaniline-MnO_2 nanofibrous	1 M $NaNO_3$	6.6 Wh kg^{-1}	100W kg^{-1}	7
RGO-PANI	1 M H_2SO_4	17.6 Wh kg^{-1}	10W kg^{-1}	8
Graphene/PANI nanofibers	1 M H_2SO_4	4.9 Wh kg^{-1}	300W kg^{-1}	9
Graphene nanoribbon/PANI	1 M H_2SO_4	7.6 Wh kg^{-1}	3.1KW kg^{-1}	10
Graphene/MWCNT/PANI	1 M H_2SO_4	21.1 Wh kg^{-1}	25KW kg^{-1}	11
Polyaniline microtubes	1 M H_2SO_4	14.1 Wh kg^{-1}	250W kg^{-1}	This work

[a] ED is the highest value in literature. [b] PD corresponding to highest energy density.

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