

**Hydrothermal synthesis of ultra-long copper nanowires
and their application in the fabrication of supercapacitor electrodes**

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Experimental procedures:

For the synthesis of ultralong CuNWs a solution of 0.017 g $\text{CuCl}_2 \cdot 2\text{H}_2\text{O}$ and 0.200 g dextrose in 9.6 ml of distilled water (solution 1) was prepared. Also, a solution of 0.2 ml oleylamine and 2 μl oleic acid in 0.4 ml ethyl alcohol was prepared (solution 2). With stirring and a hotplate temperature of 100°C , solution 1 was added dropwise to solution 2 and held at the above conditions for 20 minutes. The resulting reaction system was transferred to a 25 ml Teflon-lined stainless-steel autoclave and heated to 130°C ($2.5^\circ\text{ min}^{-1}$) for 4 h. After natural cooling of the reaction system, 6 ml of n-hexane and 15 ml of ethyl alcohol were added to the dispersed system and after the emulsions separation, the obtained Cu-nanowires were concentrated in n-hexane medium. After centrifugation (1000 rpm, 5 min), the phase containing CuNWs was separated and washed with n-hexane. Further, a slurry based on synthesized CuNWs, carbon black and polyvinylidene fluoride (PVDF) in N-methylpyrrolidone was prepared according to the mass ratio of the above components 60/30/10. This slurry was used to apply CuNWs/C/PVDF composite film on a pre-cleaned in ethyl alcohol Ni foam substrate (1.2 cm^2 area; 0.495 mg cm^{-2} mass loading). Then the film was dried in a vacuum chamber at 130°C for 40 min. In order to oxidize copper nanowires to enhance the pseudocapacitive contribution to the electrochemical capacitance of the electrode formed, the sample was subjected to additional heat treatment in air at 150°C (4h). The electrochemical performance of the resulting film was examined using a P-45X potentiostat-galvanostat with FRA 24M electrochemical impedance measurement module within a three-electrode scheme in KOH ($c = 3\text{ mol dm}^{-3}$) in the potential range of 0–0.55 V by cyclic voltammetry (CV), galvanostatic charge-discharge (GCD) and electrochemical impedance spectroscopy (EIS). Graphite electrode was used as an auxiliary electrode and Ag/AgCl electrode was used as a reference electrode.

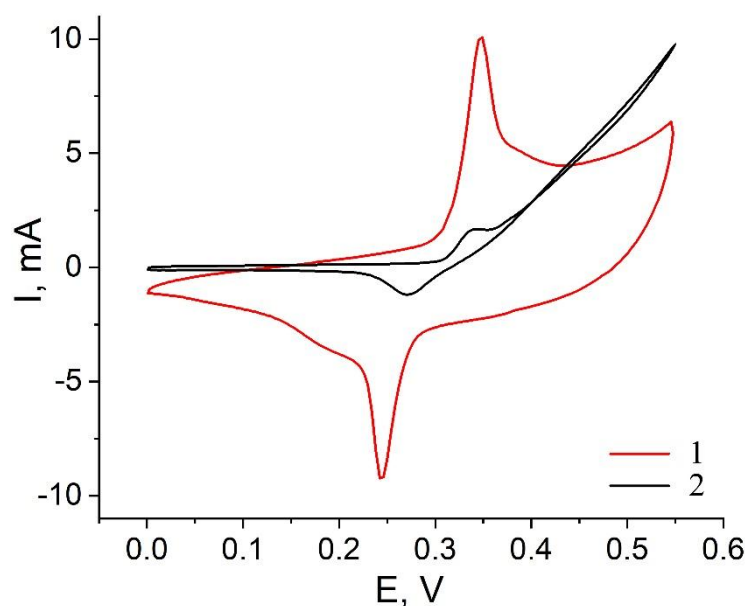


Figure S1 Comparison of CV curves for oxidized CuNWs film (curve 1) and a clean nickel foam substrate heat-treated under similar conditions (curve 2) at a scan rate of 100 mV s^{-1} in a potassium hydroxide medium (3 mol dm^{-3}).

Table S1 Comparison of electrochemical performance of common electrode materials.

Materials	Specific Capacitance/ mF cm^{-2}	Scan rate/ mV s^{-1}	Specific Capacitance/ mF cm^{-2}	Current density/ mA cm^{-2}	Ref.
Cu(OH)_2	42	20	-	-	[S1]
Cu wire/CuO NWs	82.66	5	88.28	0.5	[S2]
Cu_2O (thin films)	30	5	-	-	[S3]
$\text{Cu}_2\text{O/Cu}$ (columnar array)	128.6	5	-	-	[S4]
Cu NWs	-	-	1700	0.5	[S5]
MnO_2/Cu decorated nickel foam	557	5			[S6]
RGO/SnO_2	-	-	374	1	[S7]
VO_2/TiO_2 (nanosponges)	86.2	10	-	-	[S8]
$\text{Cu/Cu}_2\text{O/CuO}$ NWs	26.158	5	21.198	2	[S9]
CuO NWs	61	1	32.9	0.625	This work

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