Electronic Supplementary Material (ESI) for Lab on a Chip.

Supporting Information

Synthesis and protection: a controllable electrochemical approach to polypyrrole-coated copper azide with superior safety for MEMS

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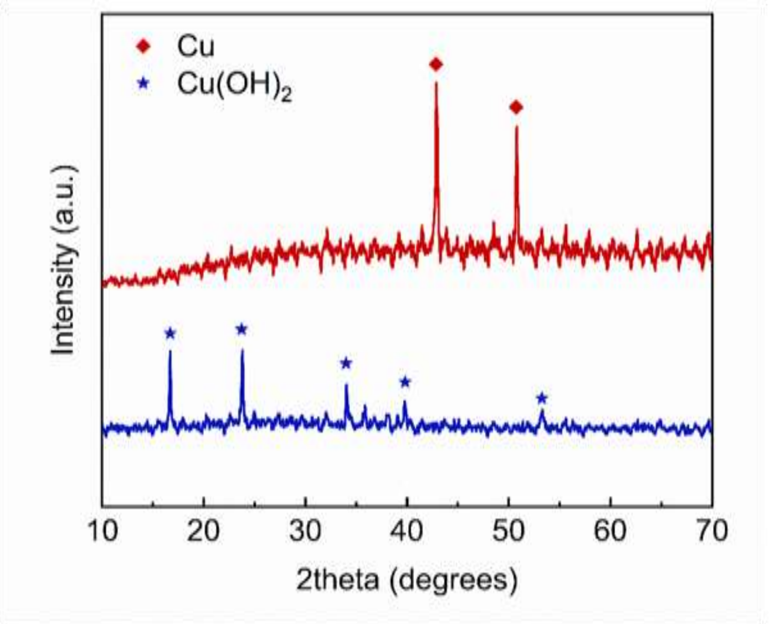

Figure S1. The XRD patterns for the $Cu(OH)_2$ and Cu.

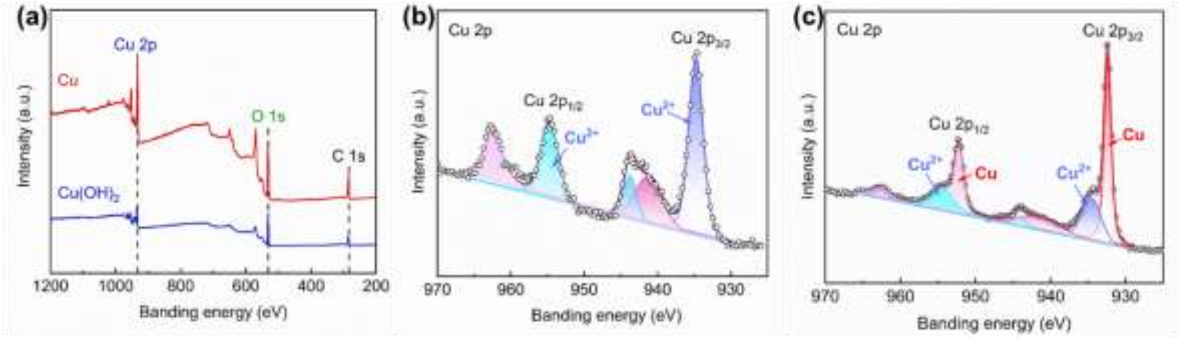

Figure S2. (a) XPS survey spectrum of $Cu(OH)_2$ and Cu, (b) XPS Cu 2p of $Cu(OH)_2$, (c) XPS Cu 2p of Cu.

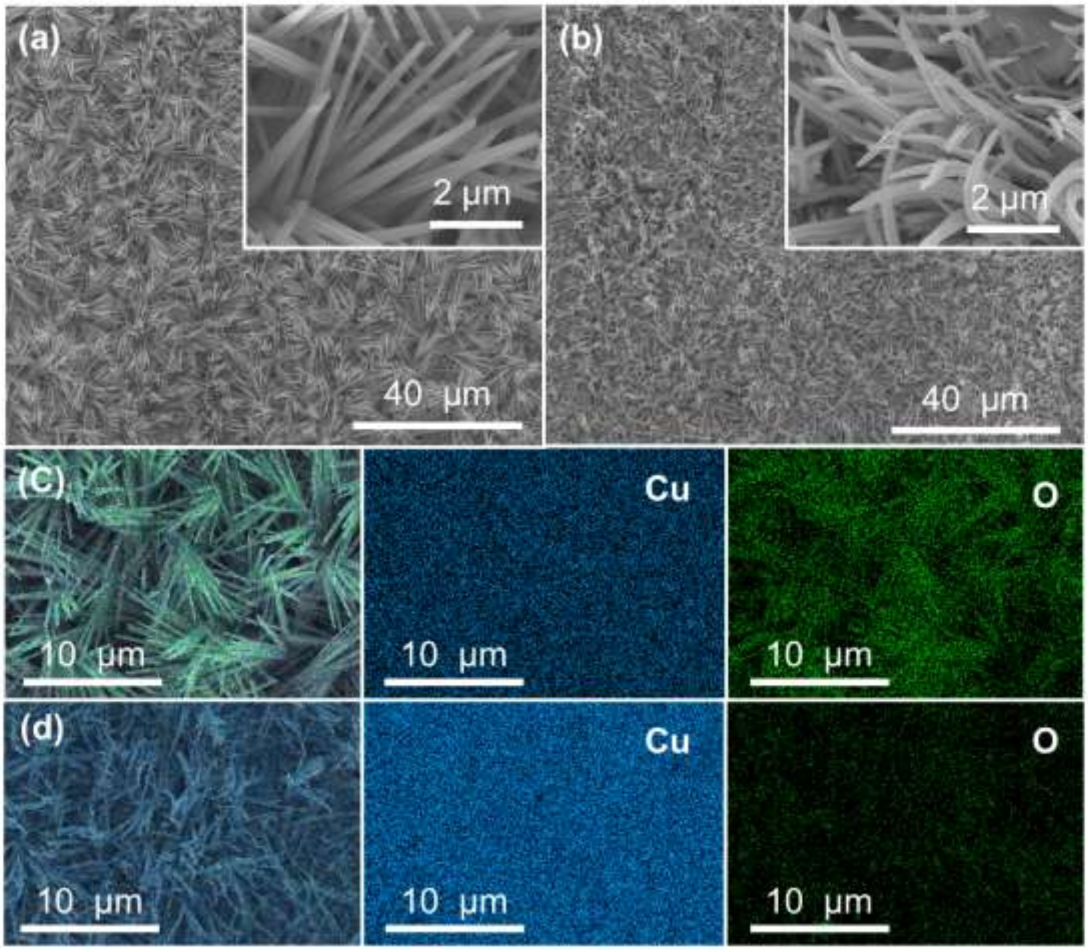

Figure S3. SEM of (a) $Cu(OH)_2$ nanorods and (b) Cu nanorods. Elemental mapping images of (c) $Cu(OH)_2$ film and (d) Cu film.

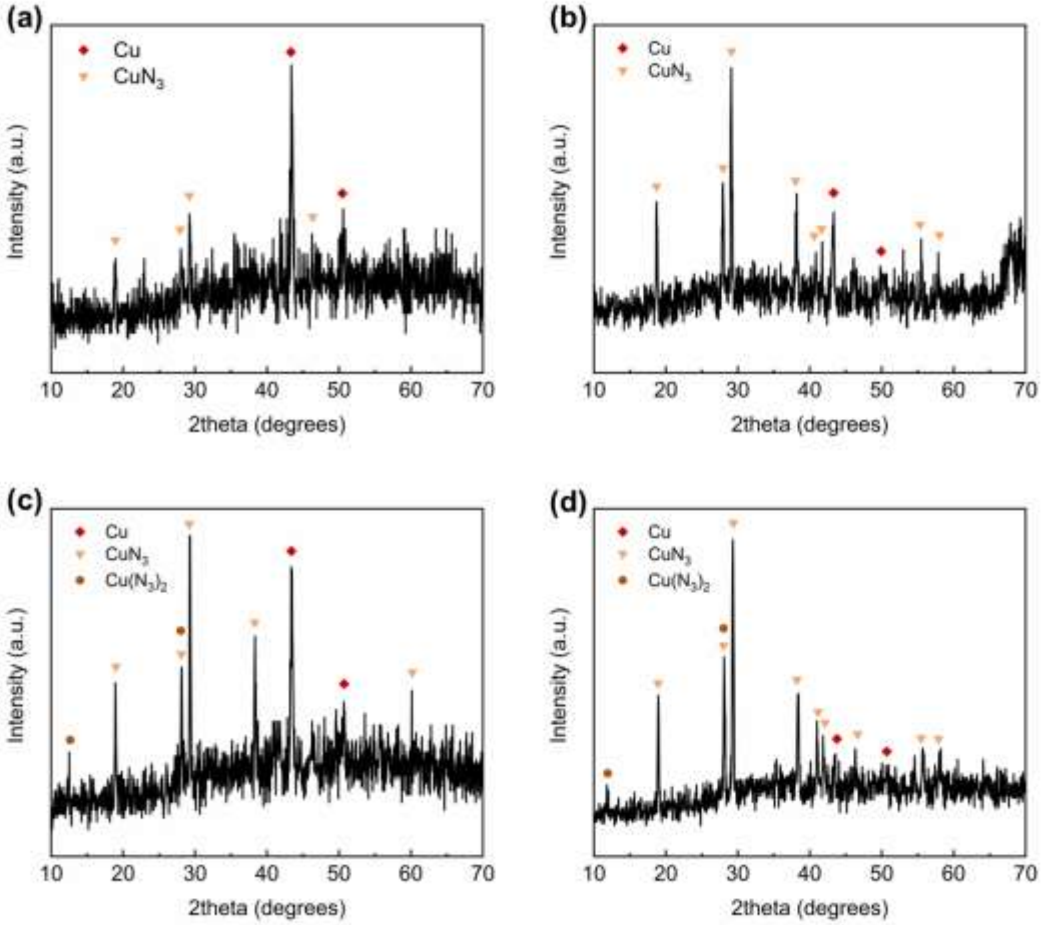

Figure S4. The XRD patterns for the CA film (a) at 1 mA/cm^2 for 10 min, (b) 1 mA/cm^2 for 20 min, (c) 2 mA/cm^2 for 10 min, (d) 2 mA/cm^2 for 20 min.

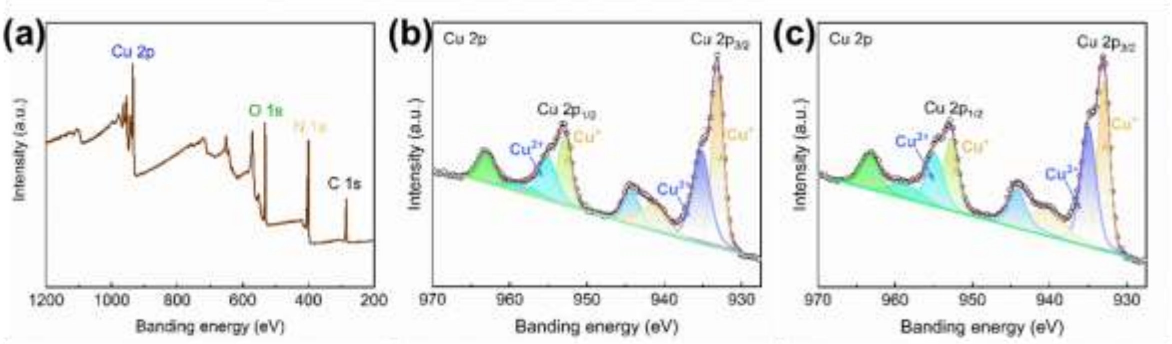

Figure S5. (a) XPS survey spectrum of CA. XPS spectrum of the N 1s regions for the CA film of (b) 1 mA/cm^2 for 30 min, (c) 2 mA/cm^2 for 30 min.

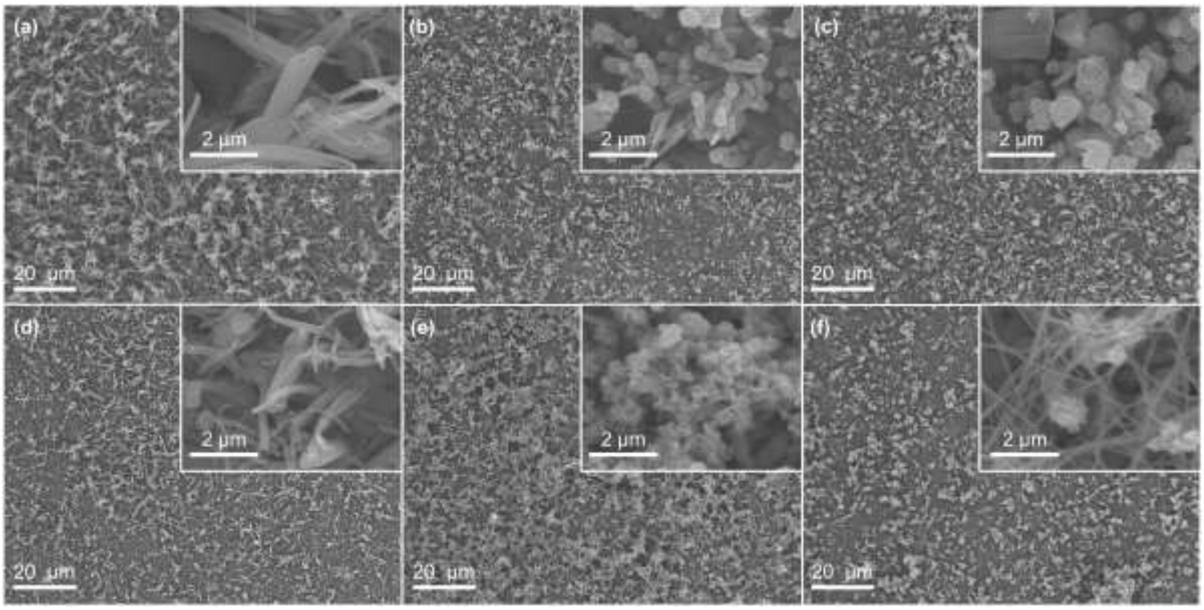

Figure S6. The SEM iamges for the CA film of (a) 1 mA/cm^2 for 10 min, (b) 1 mA/cm^2 for 20 min, (c) 1 mA/cm^2 for 30 min (d) 2 mA/cm^2 for 10 min (e) 2 mA/cm^2 for 20 min (f) 2 mA/cm^2 for 30 min.

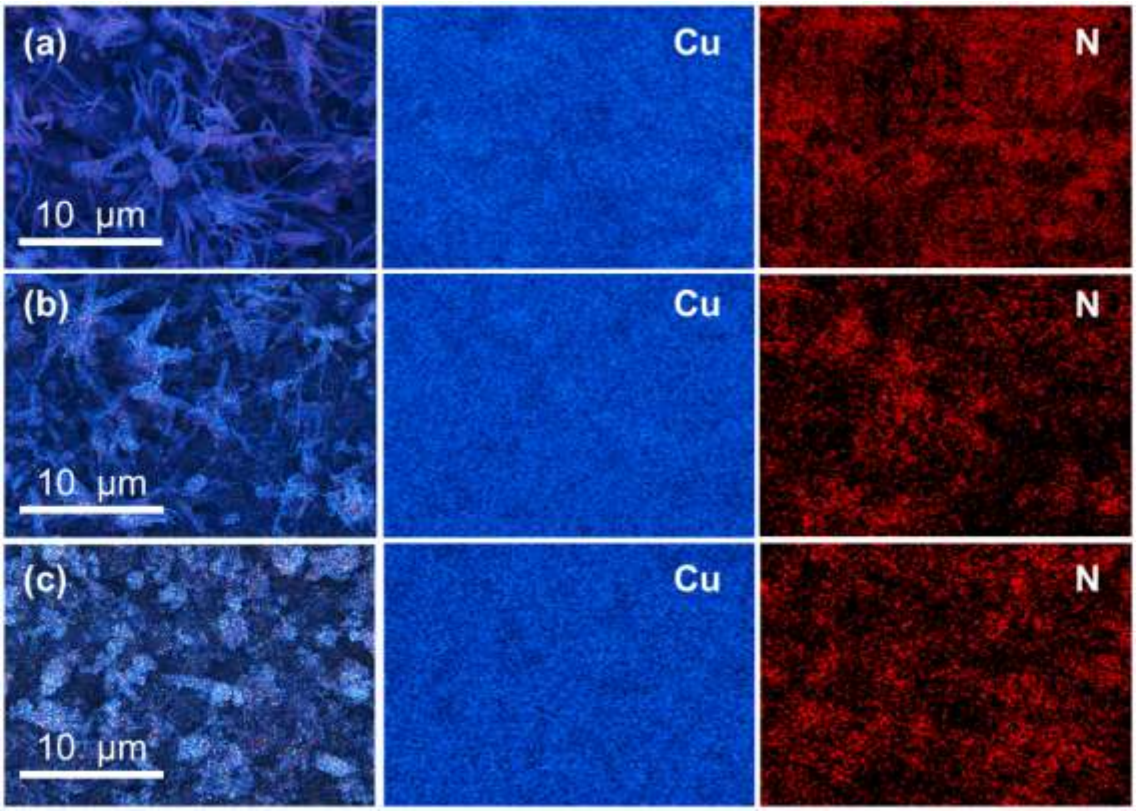

Figure S7. Elemental mapping images of the CA film at 1 mA/cm^2 with different azidation time of (a) 10 min, (b) 20 min and (c) 30 min.

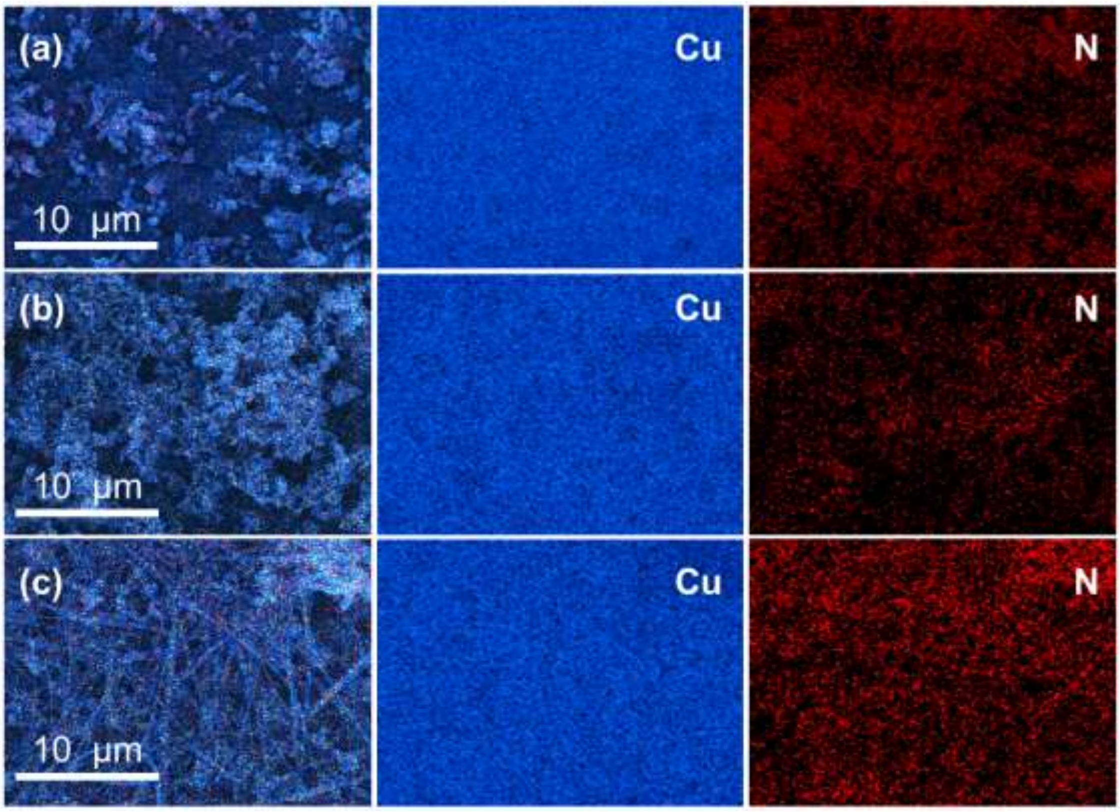

Figure S8. Elemental mapping images of the CA film at 2 mA/cm2 with different azidation time of (a) 10 min, (b) 20 min and (c) 30 min.

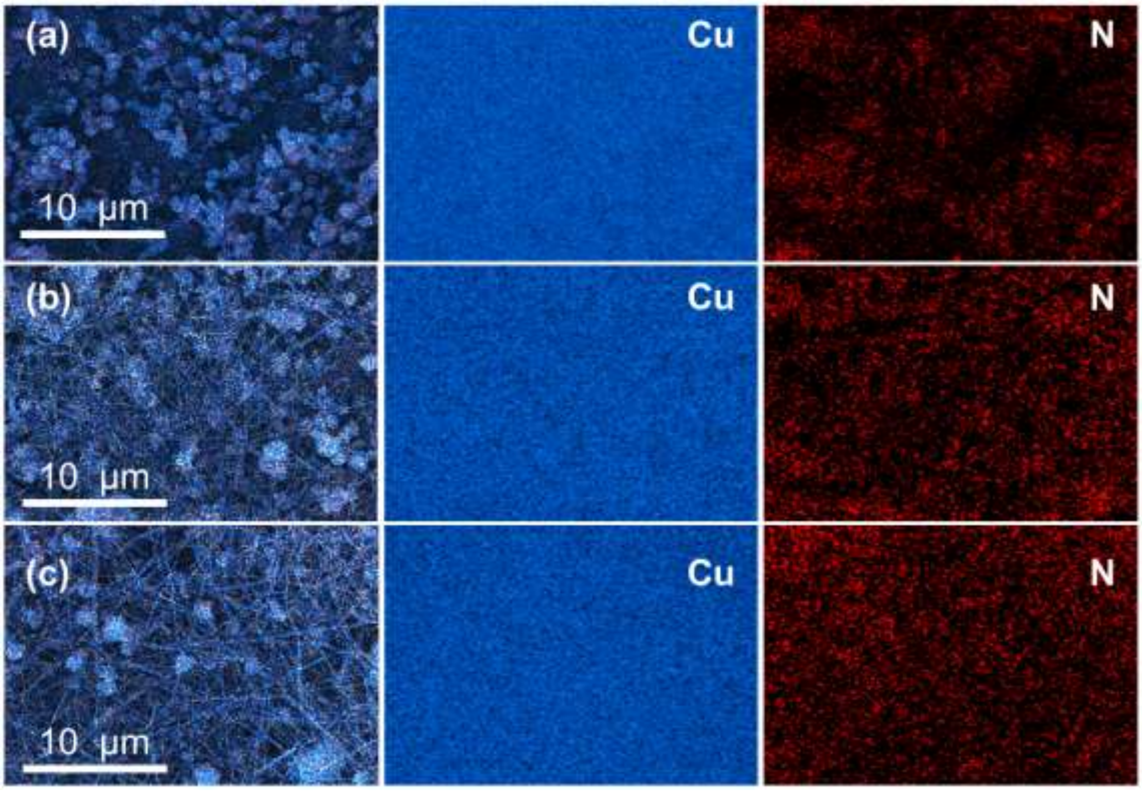

Figure S9. Elemental mapping images of the CA film at 3 mA/cm^2 with different azidation time of (a) 10 min, (b) 20 min and (c) 30 min.

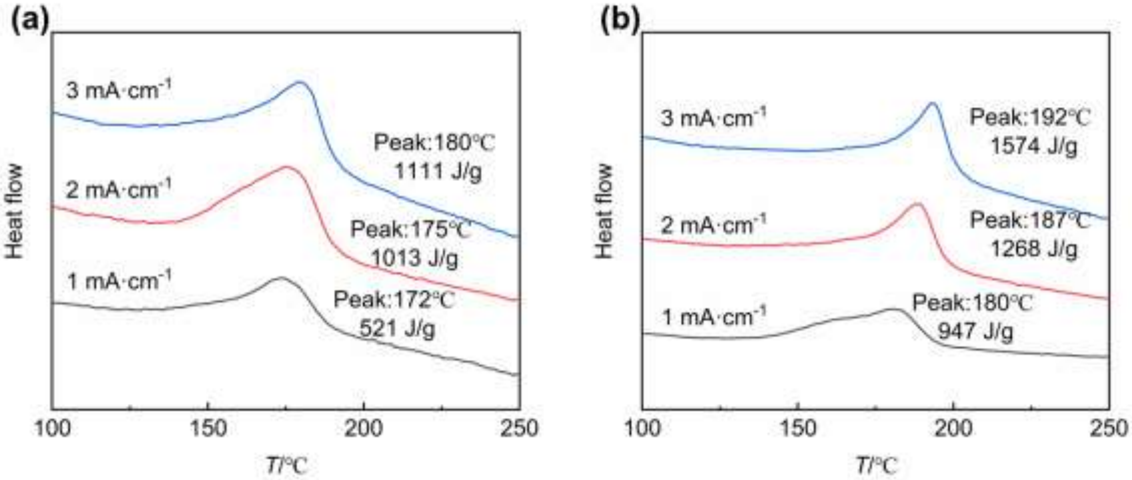

Figure S10. The DSC curves for the CA film with different azidation time of (a) 10 min and (b) 20 min.

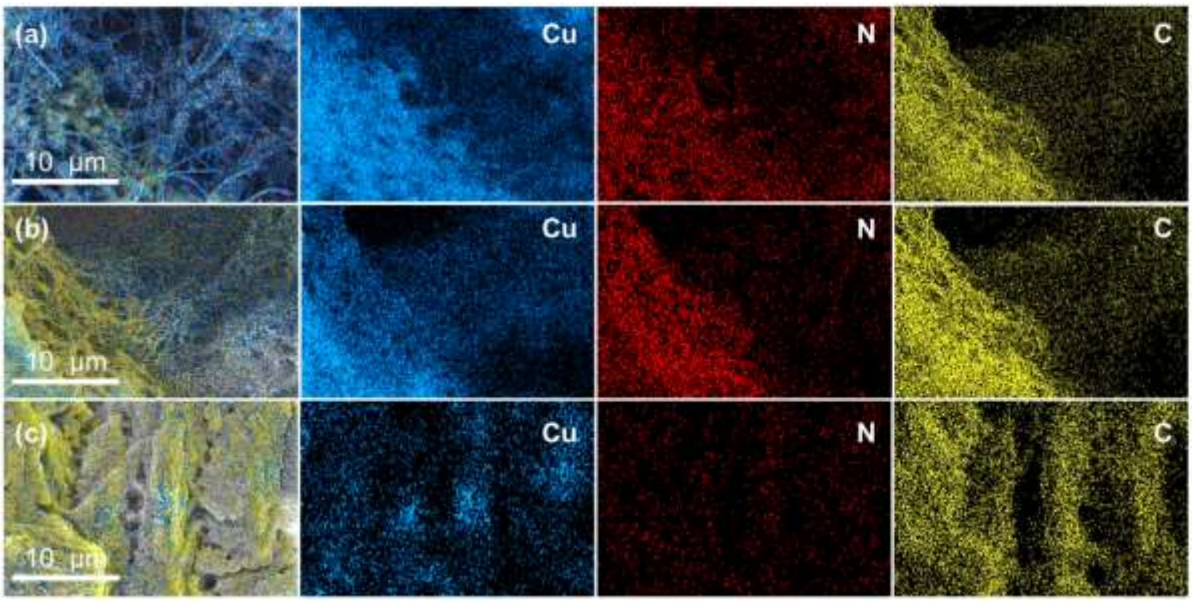

Figure S11. Elemental mapping images of the CA@PPy films with different coating time of (a) 100 s, (b) 300 s and (c) 500 s.

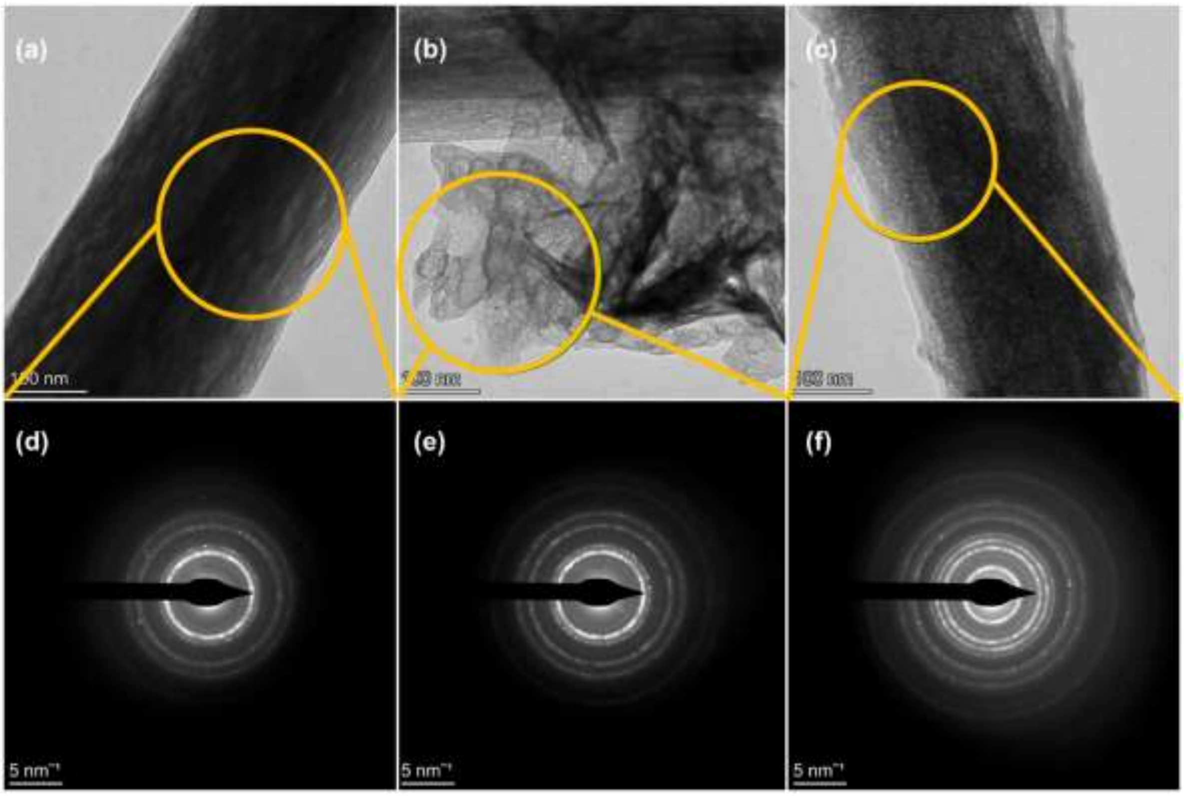

Figure S12. HRTEM for (a,d) $Cu(N_3)_2$, (b,e) CuN_3, (c,f) CA@PPy.

Table S1 ICP-OES of CA and CA@PPy

sample	element	the content of elements (%)	Average (%)
CA	Cu	47.72	47.48
	Cu	47.25	
CA@PPy	Cu	28.83	28.79
	Cu	28.75	

Inductively coupled plasma optical emission spectrometer (ICP-OES) was characterized by Agilent 5110. Tab. S1 shows that the content of Cu reduces from 47.48% to 28.79%. According to this, the CA content is calculated to be ca. 60.6 wt%.

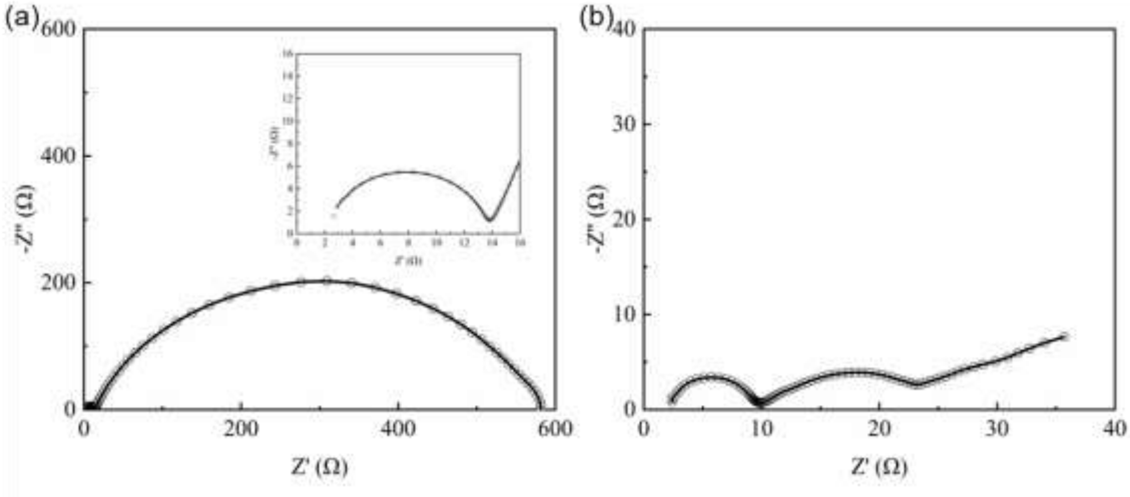

Figure S13. Nyquist plots derived from electrochemical AC impedance spectroscopies of (a) CA, (b) CA@PPy.

Electrochemical impedance spectroscopies (EIS) of CA and CA@ppy were conducted using a CHI660E potentiostat (CH Instruments, China) in a typical three-electrode setup with an electrolyte solution, a platinum film as the counter electrode and a saturated Hg/HgO electrode as the reference electrode. 0.02 M NaN_3 and 0.5 M $NaNO_3$ were used as electrolyte formeasurements. EIS measurements were carried out in the frequency range of 10 MHz–0.01 Hz over an AC perturbation of 5 mV.

There are two semicircles in both curves. The first semicircle attributes to resistance of interface between electrolyte and electrodes. The second attributes to the charge transfer resistance. CA exhibits the large charge transfer resistance (565.9 Ω), whereas the radii of the semicircle of CA@PPy (16.45 Ω) is significantly reduced. These indicate that the polypyrrole-coated modification helps improving the charge transfer ability of CA.