

## Supporting information

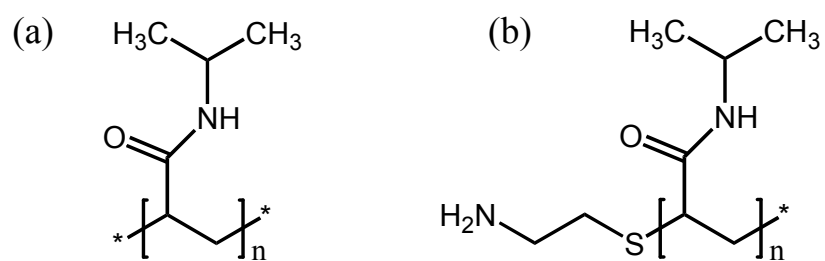
### Catalytic activities for methanol oxidation on ultrathin CuPt<sub>3</sub> wavy nanowires with/without smart polymer

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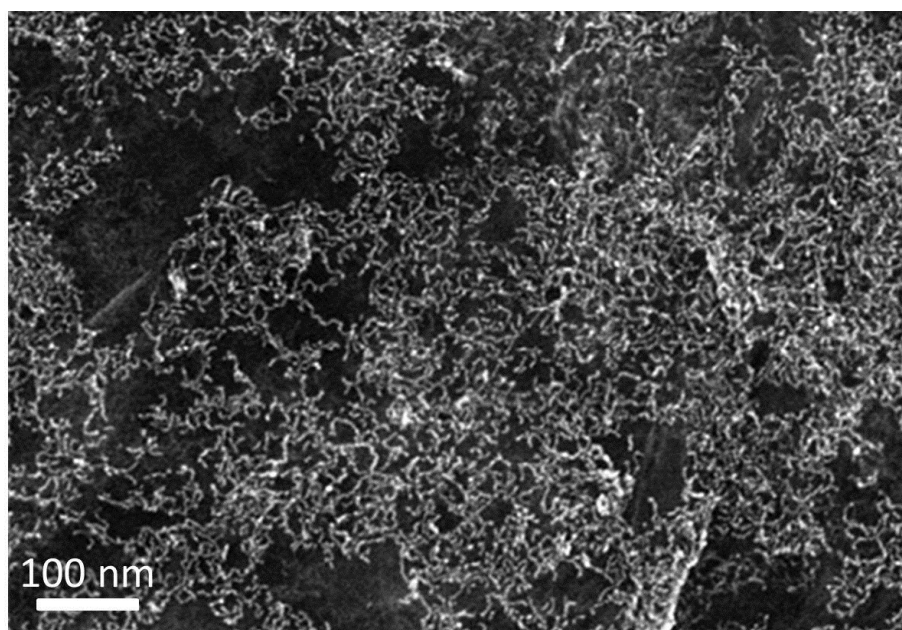
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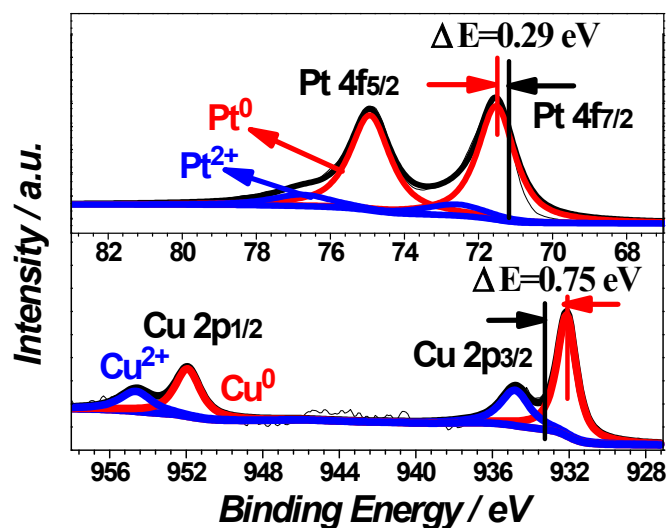
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**Fig. S1** Molecular structures of (a) PNIPAM and (b) PNIPAM-NH<sub>2</sub>.

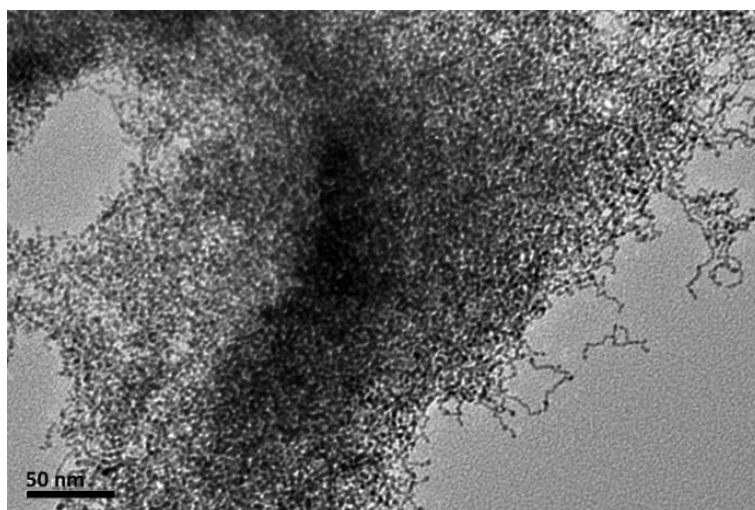


**Fig. S2** SEM image of the CuPt<sub>3</sub> wavy nanowires.

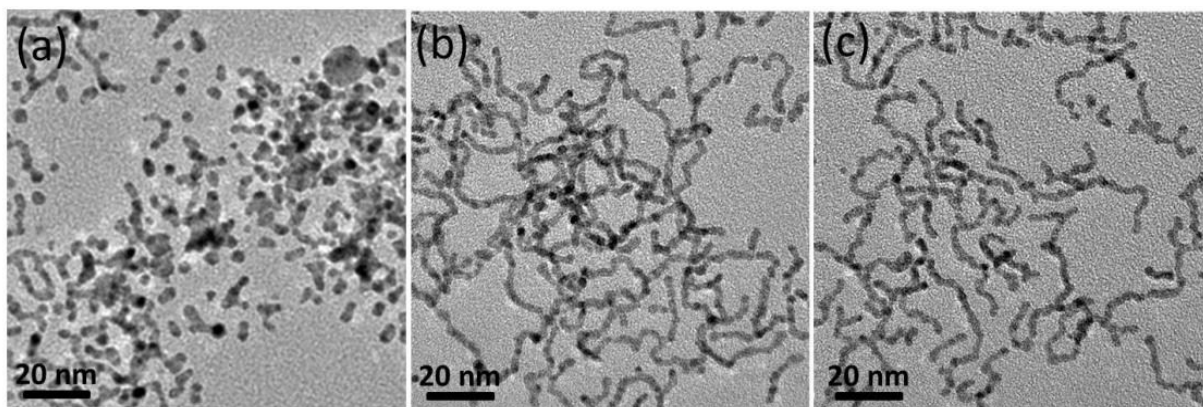


**Fig. S3** High-resolution Pt 4f and Cu 2p XPS spectra of the CuPt<sub>3</sub> wavy nanowires. (Note: the vertical black lines represent the standard value of Pt 4f<sub>7/2</sub> and Cu 2p<sub>3/2</sub>, respectively).

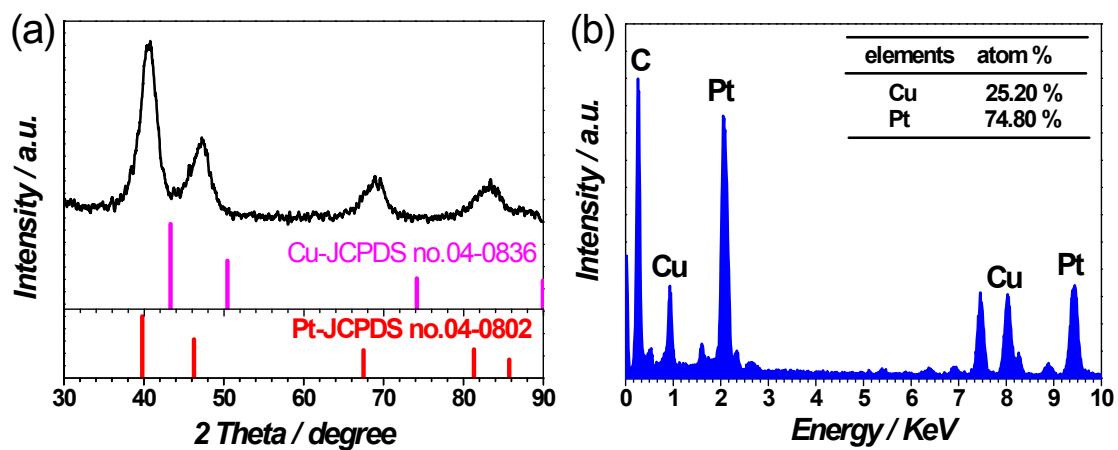
By measuring the relative peak areas, it is found that the percentages of Pt and Cu oxidation state at the CuPt<sub>3</sub> wavy nanowires remain at a low state (Pt<sup>2+</sup>:15.2%; Cu<sup>2+</sup>:32.0%).



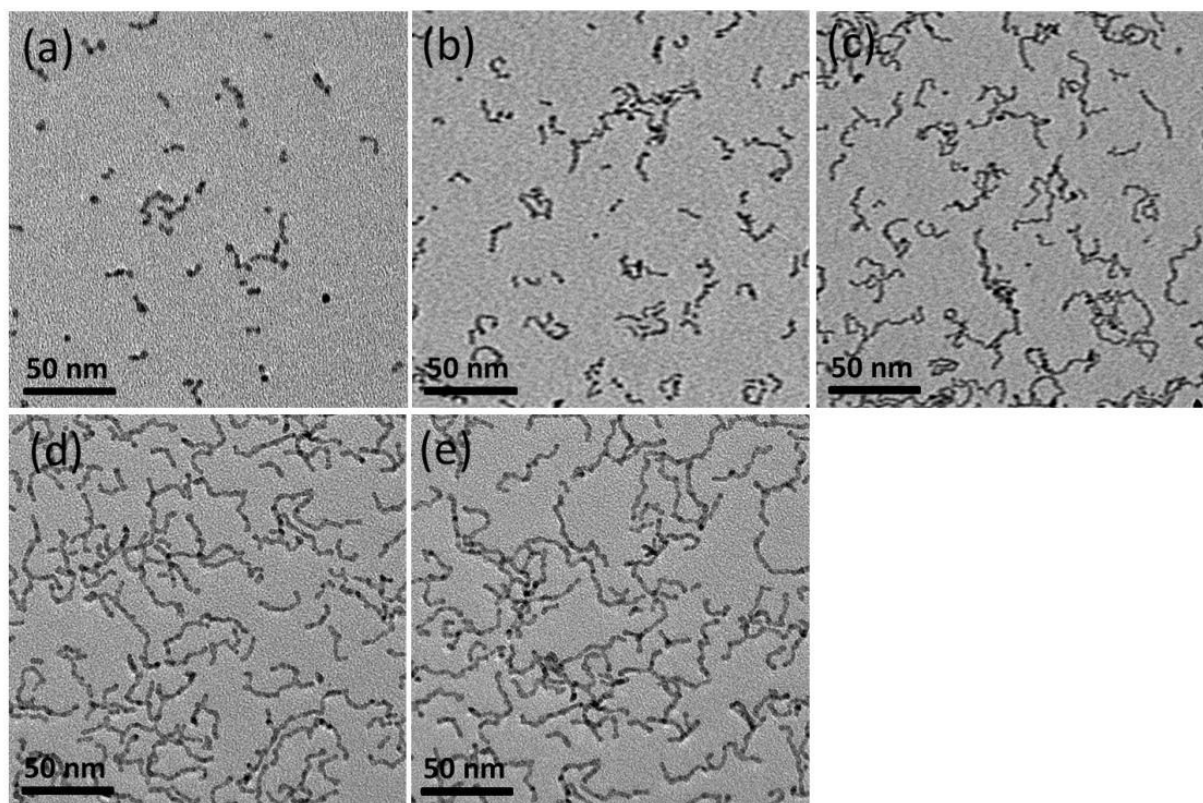
**Fig. S4** TEM image of the CuPt<sub>3</sub> nanowires. (Note: The sample was prepared by placing a drop of the colloidal solution or catalyst powder dispersion in 50 °C ethanol solution (99%) on a carbon film coated Ni grid, followed by drying under 50 °C)



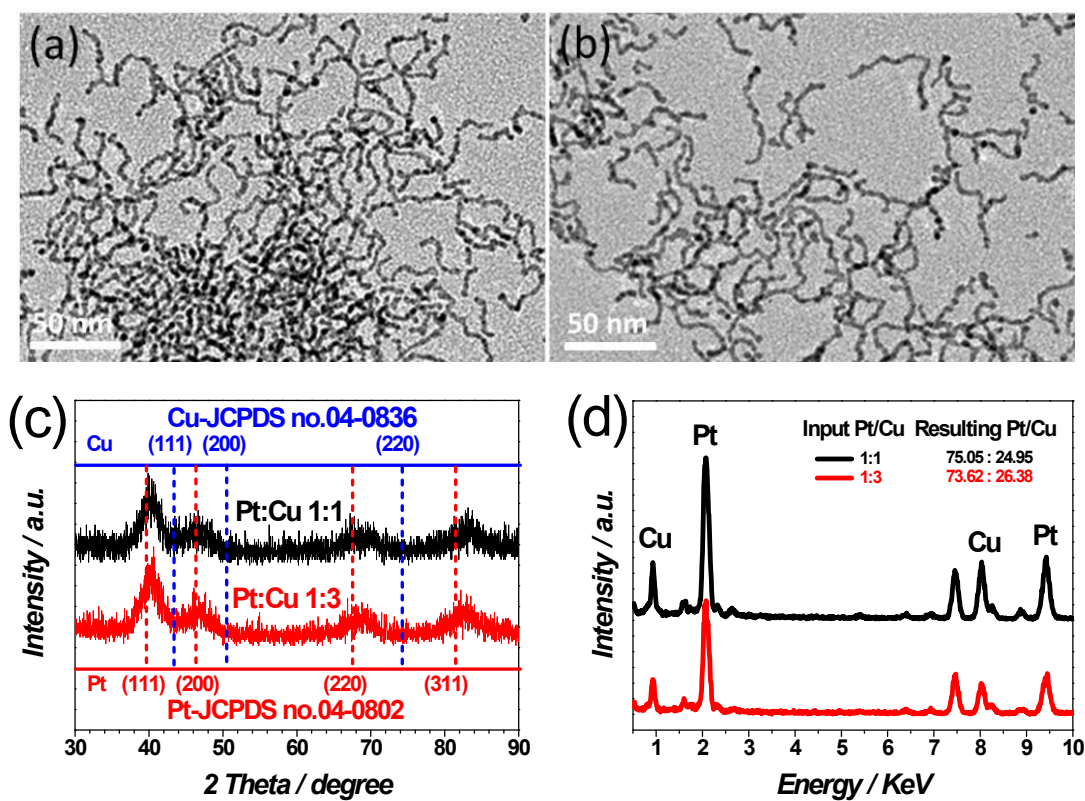
**Fig. S5** TEM images of the CuPt<sub>3</sub> nanostructures prepared using the standard procedure, except for the use of different amount of PNIPAM-NH<sub>2</sub>: (a) 0.5 ml, (b) 1.0 ml and (c) 2.0 ml.



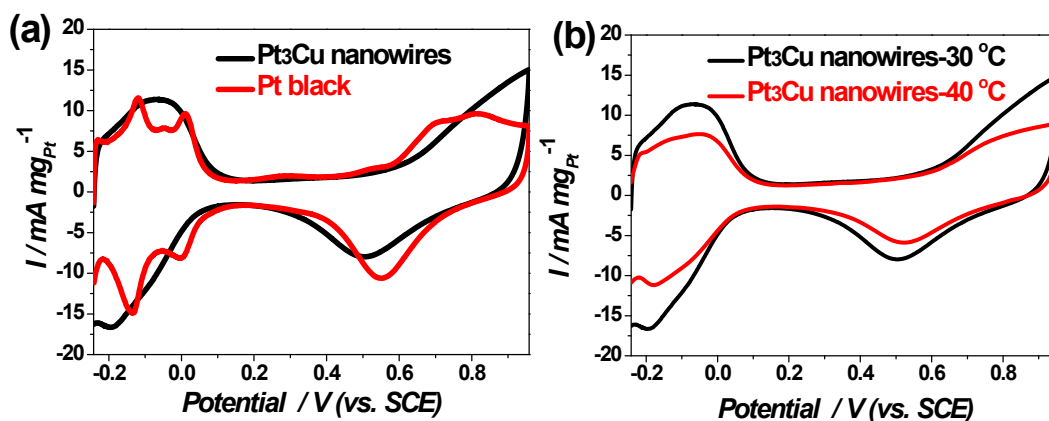
**Fig. S6** (a) XRD pattern and (b) EDX spectrum of the products shown in Fig. S5a.



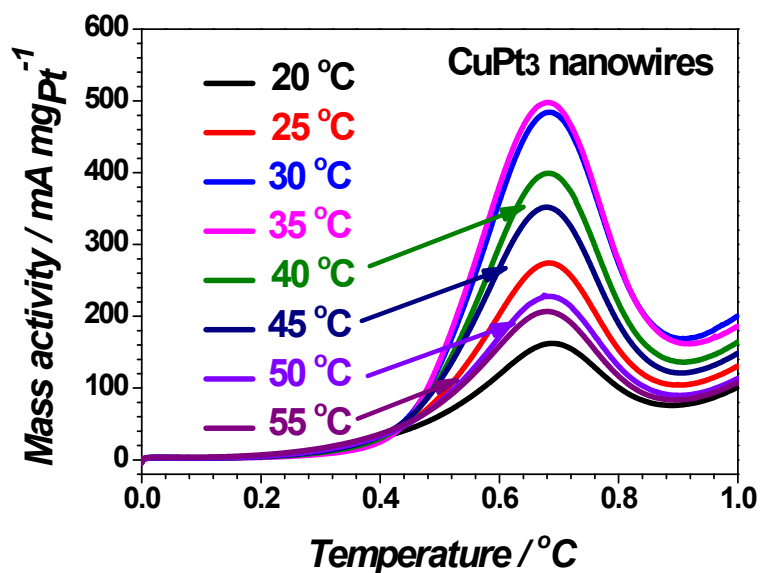
**Fig. S7** Magnified TEM images of the CuPt<sub>3</sub> wavy nanowires collected at different growth stages: (a) 0.5 h, (b) 1 h, (c) 2 h, (d) 4 h and (e) 6 h.



**Fig. S8** TEM images of CuPt<sub>3</sub> wavy nanowires prepared with different input molar ratio of Cu/Pt: (a) 1:1 and (b) 3:1. (c) The corresponding XRD patterns and (d) EDX spectra for the CuPt<sub>3</sub> wavy nanowires prepared with different input molar ratio of Pt/Cu.

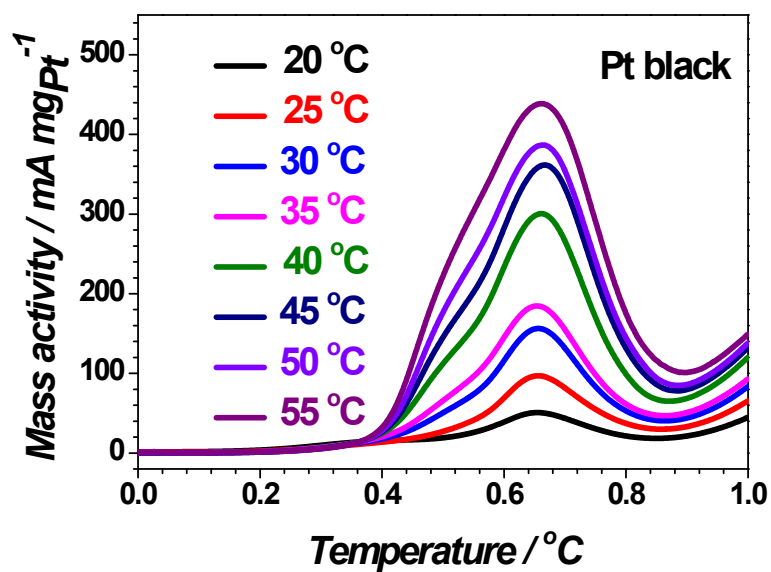


**Fig. S9** (a) CVs for the CuPt<sub>3</sub> wavy nanowires and Pt black at 30°C in N<sub>2</sub>-saturated 0.5 M H<sub>2</sub>SO<sub>4</sub> solution at the scan rate of 50 mV s<sup>-1</sup>. (b) CVs for the CuPt<sub>3</sub> wavy nanowires at two representative temperatures: 30 °C and 40 °C.

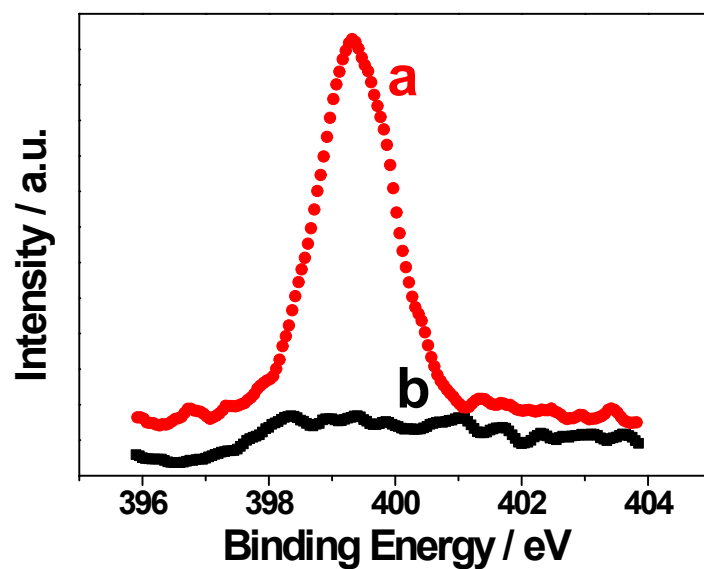


**Fig. S10** CVs for the CuPt<sub>3</sub> wavy nanowires recorded at different temperature in N<sub>2</sub>-saturated 0.5 M CH<sub>3</sub>OH + 0.5 M H<sub>2</sub>SO<sub>4</sub> solution at the scan rate of 50 mV s<sup>-1</sup>.



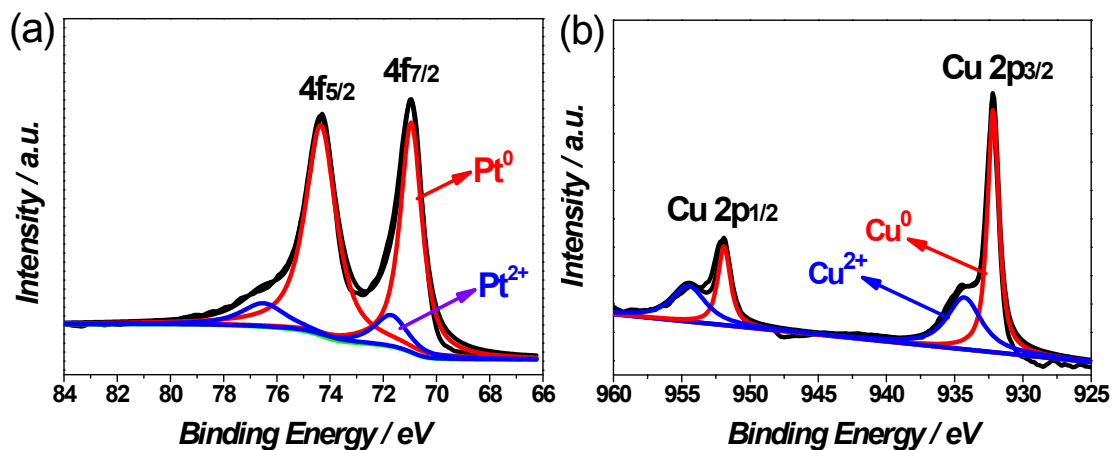


**Fig. S11** CVs for the Pt black recorded at different temperature in N<sub>2</sub>-saturated 0.5 M CH<sub>3</sub>OH + 0.5 M H<sub>2</sub>SO<sub>4</sub> solution at the scan rate of 50 mV s<sup>-1</sup>.

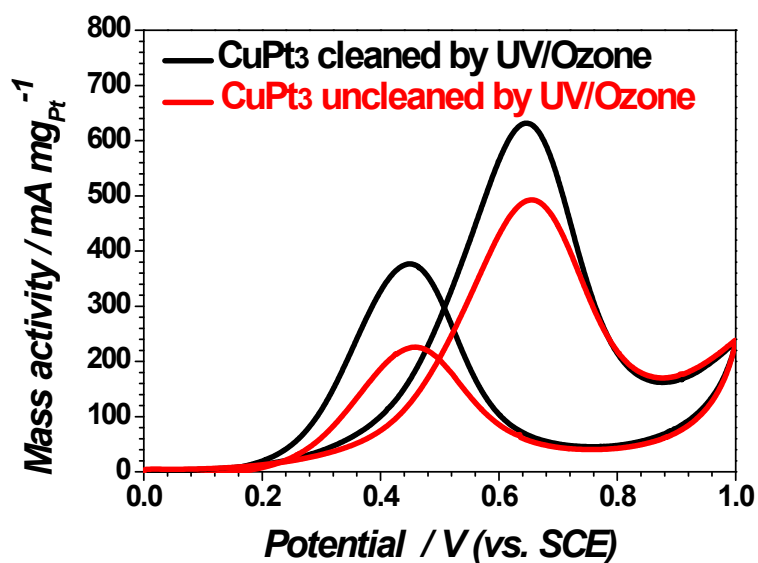


**Fig. S12** XPS spectrum of the CuPt<sub>3</sub> nanowires in the N1s region (a) before and (b) after UV/Ozone treatment.

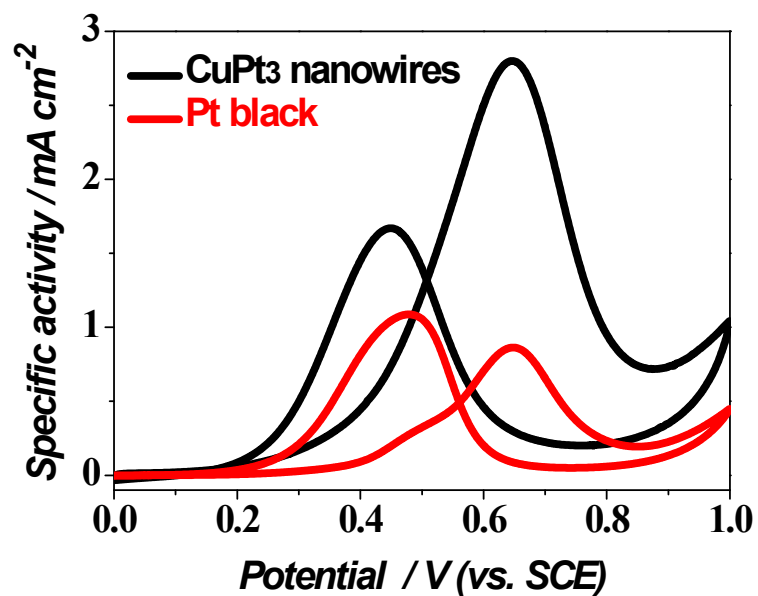




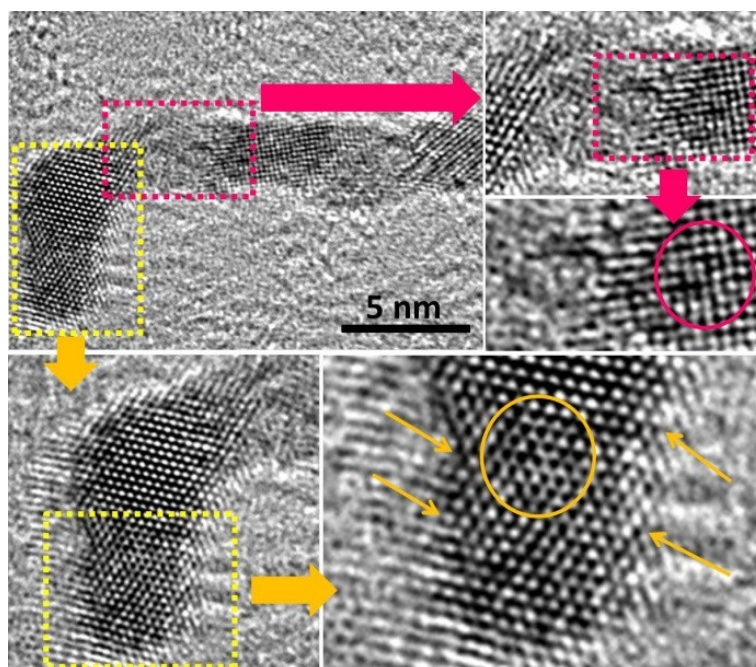
**Fig. S13** High-resolution (a) Pt 4f and (b) Cu 2p XPS spectra of the “clean” CuPt<sub>3</sub> wavy nanowires.



**Fig. S14** Mass activities of the CuPt<sub>3</sub> nanowires before and after UV/Ozone treatment in N<sub>2</sub>-saturated 0.5 M CH<sub>3</sub>OH + 0.5 M H<sub>2</sub>SO<sub>4</sub> solution at the scan rate of 50 mV s<sup>-1</sup>.



**Fig. S15** Specific activities for the CuPt<sub>3</sub> nanowires and Pt black in N<sub>2</sub>-saturated 0.5 M CH<sub>3</sub>OH + 0.5 M H<sub>2</sub>SO<sub>4</sub> solution at the scan rate of 50 mV s<sup>-1</sup>.



**Fig. S16** High-resolution TEM images of CuPt<sub>3</sub> wavy nanowires at different regions. The atomic steps and crystal face defects exposed on the surface are indicated by arrows and cycles.