

## Supplementary Information

### **Nanotube-shaped PtFe intermetallics: Control synthesis, crystal structure and their improved electrocatalytic activities**

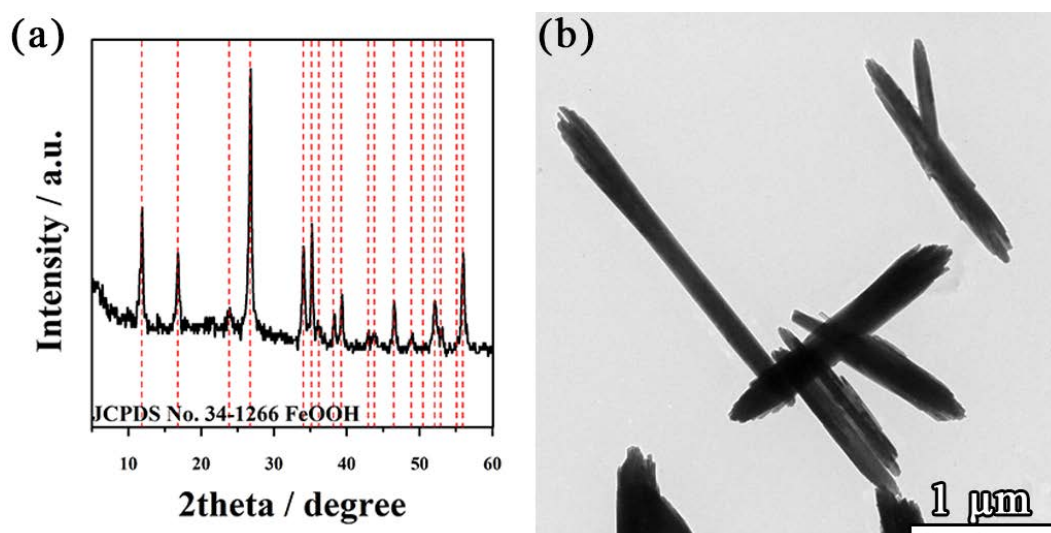
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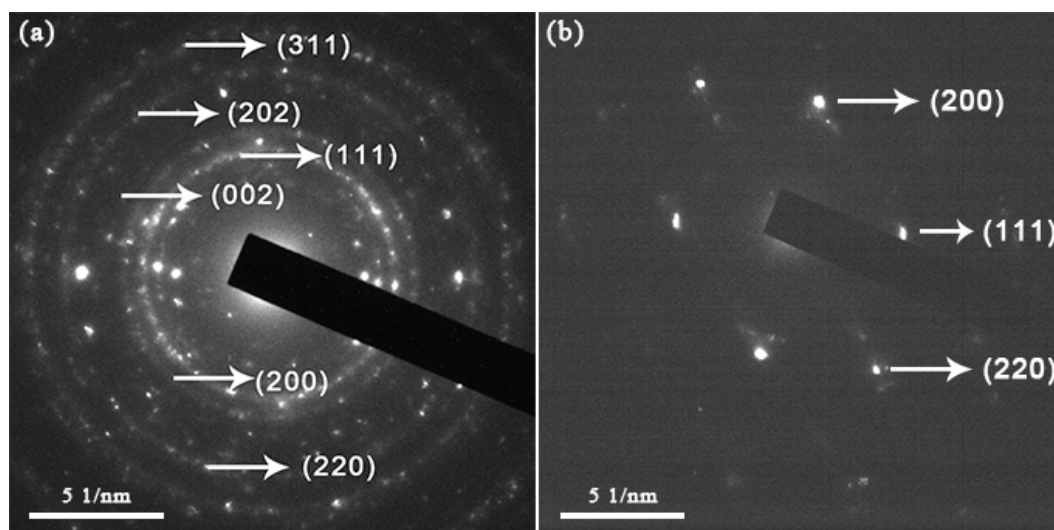
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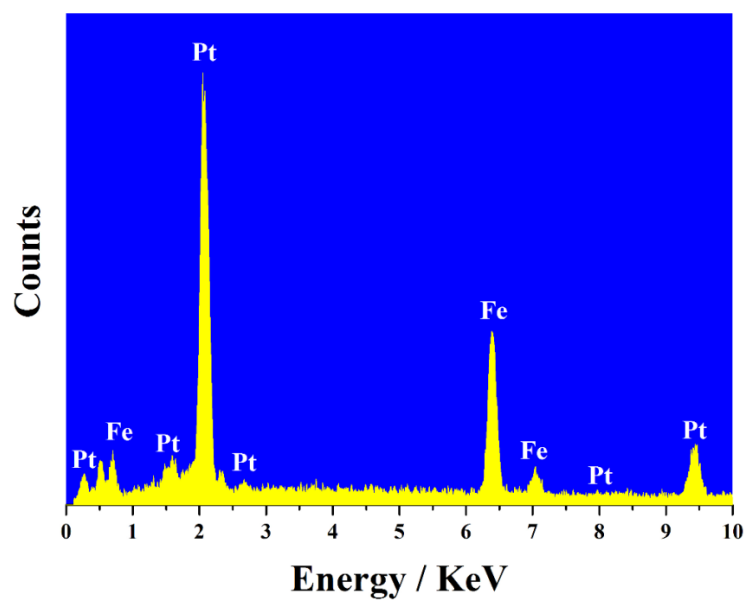
[zhangshoulin@njnu.edu.cn](mailto:zhangshoulin@njnu.edu.cn)



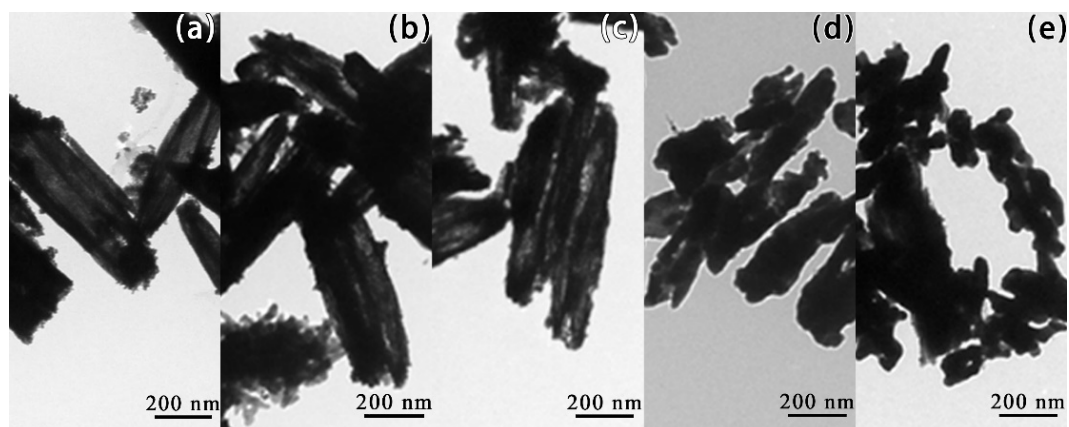
**Fig. S1** (a) XRD pattern and (b) TEM image of FeOOH nanorod.



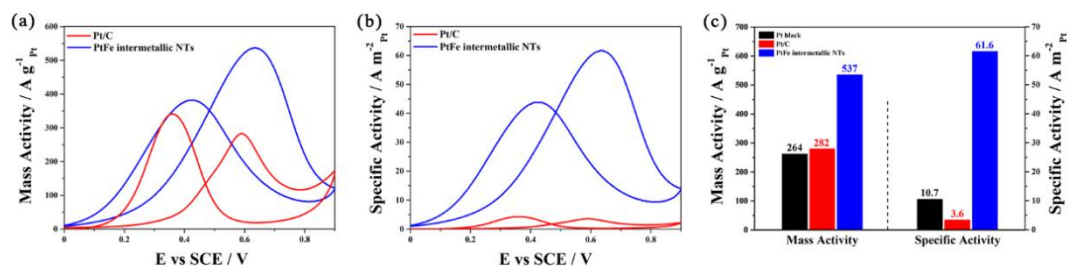
**Fig. S2** Selected area electron diffraction patterns of the PtFe intermetallic nanotube of (a) as a whole and (b) a single PtFe intermetallic nanoparticle sitting on the surface of the tube.



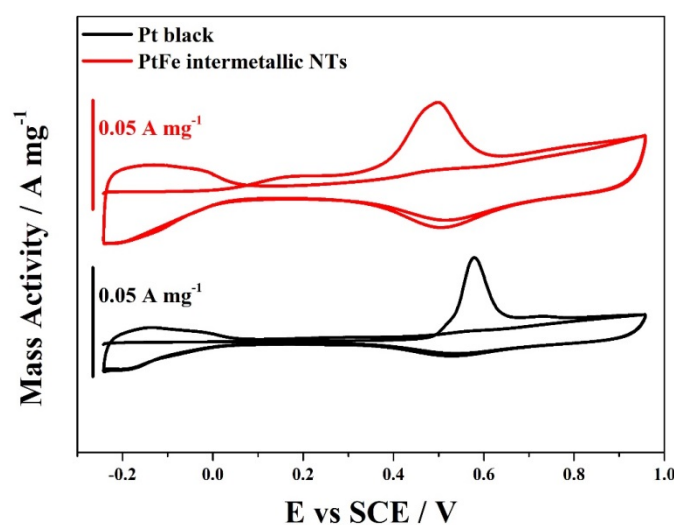
**Fig. S3** EDX spectrum of order PtFe intermetallic nanotube.



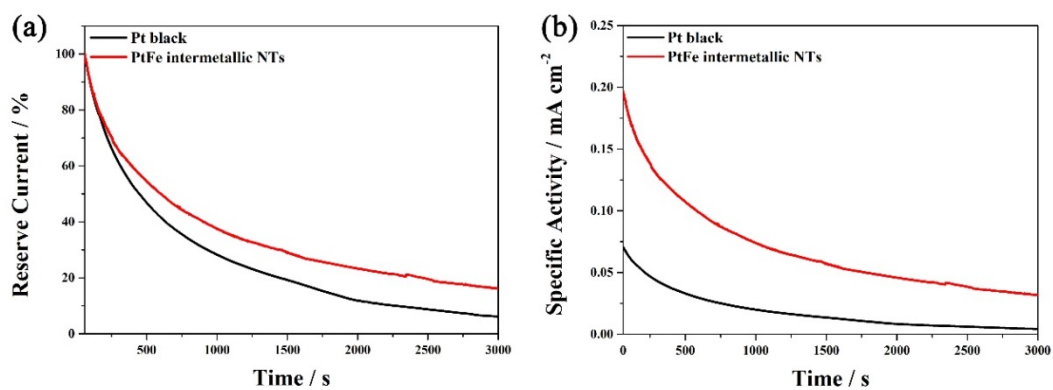
**Fig. S4** TEM images of (a) PtFe-300, (b) PtFe-400, (c) PtFe-500, (d) PtFe-600, (e) PtFe-700.



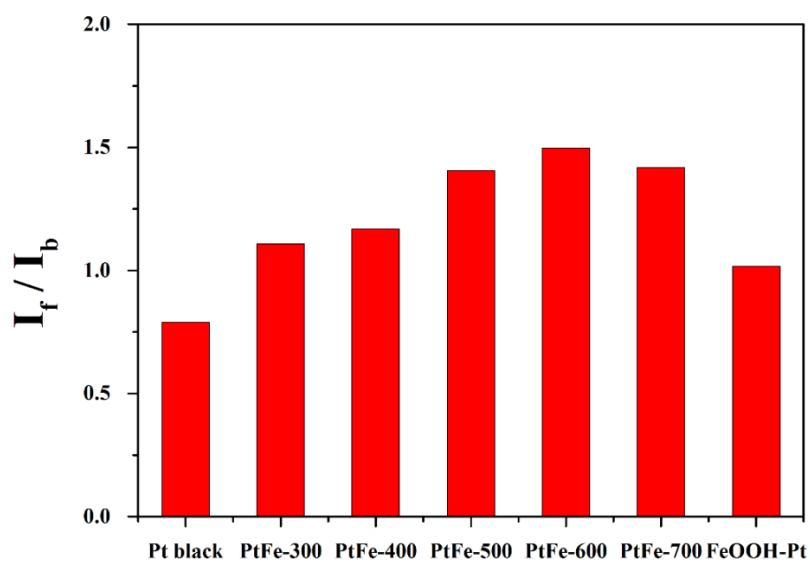
**Fig. S5** (a) Mass-normalized, (b) ECSA-normalized cyclic voltammograms of Pt/C (red line) and PtFe intermetallic NTs (blue line) in the N<sub>2</sub>-saturated 1 M CH<sub>3</sub>OH + 0.5 M H<sub>2</sub>SO<sub>4</sub> solution at a scan rate of 50 mV s<sup>-1</sup>, and (c) the comparison of the corresponding  $I_f$  of the related catalysts.



**Fig. S6** Cyclic voltammograms of pre-absorbed CO at PtFe intermetallic NTs (red line) and Pt black (black line) in 0.5 M H<sub>2</sub>SO<sub>4</sub> solution at the scan rate of 50 mV s<sup>-1</sup>.

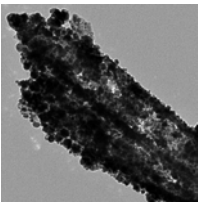
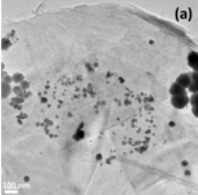
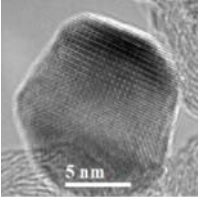
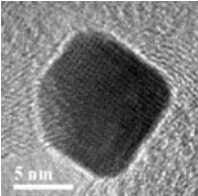
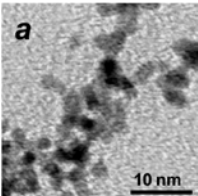
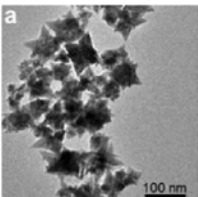
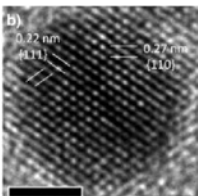


**Fig. S7** Chronoamperometry curves of PtFe intermetallic NTs and Pt black in 1 M CH<sub>3</sub>OH + 0.5 M H<sub>2</sub>SO<sub>4</sub> solution at 0.7 V.



**Fig. S8**  $I_f/I_b$  of PtFe-300, PtFe-400, PtFe-500, PtFe-600, PtFe-700, FeOOH-Pt and Pt black.

**Table S1** Activity comparison of Pt-based intermetallic catalysts toward methanol oxidation reaction.

No	Catalysts	Mass Activity (A g <sup>-1</sup> <sub>Pt</sub> )	Specific Activity (A m <sup>-2</sup> <sub>Pt</sub> )	Electrolyte	Morphology	Ref.
1	PtFe intermetallic nanotube	536	61.64	0.5 M H <sub>2</sub> SO <sub>4</sub> and 1 M CH <sub>3</sub> OH solution		Our work
2	Ga-Pt intermetallic nanoparticle embedded in graphene	76	14.80	0.5 M KOH and 2M CH <sub>3</sub> OH solution		<i>Electrochim. Acta</i> , 2015, <b>190</b> , 659-667
3	Pt <sub>3</sub> Ti/C inter-metallic nanoparticle	149	0.31	0.1 M HClO <sub>4</sub> and 1 M CH <sub>3</sub> OH solution		<i>J. Am. Chem. Soc.</i> , 2014, <b>136</b> , 10206-10209
4	Pt <sub>3</sub> V/C inter-metallic nanoparticle	200	0.38	0.1 M HClO <sub>4</sub> and 1 M CH <sub>3</sub> OH solution		<i>J. Am. Chem. Soc.</i> , 2014, <b>136</b> , 10206-10209
5	Pt <sub>3</sub> Ti intermetallic nanoparticles	56	6.10	0.5 M HClO <sub>4</sub> and 0.5 M CH <sub>3</sub> OH solution		<i>J. Am. Chem. Soc.</i> , 2008, <b>130</b> , 5452-5458
6	Cubic intermetallic PtCu <sub>3</sub> nanocages	50	141.0	0.1 M HClO <sub>4</sub> and 1 M CH <sub>3</sub> OH solution		<i>J. Am. Chem. Soc.</i> , 2012, <b>134</b> , 13934-13937
7	Intermetallic Pt <sub>3</sub> Zn nanocrystals	250	9.50	0.5 M methanol and 0.1 M CH <sub>3</sub> OH solution		<i>ACS Nano</i> , 2012, <b>6</b> , 5642-5647