

Electronic Supplementary Information (ESI)

Te–template Approach to Fabricating Ternary TeCuPt Alloy Nanowires with Enhanced Catalytic Performance towards Oxygen Reduction Reaction and Methanol Oxidation Reaction

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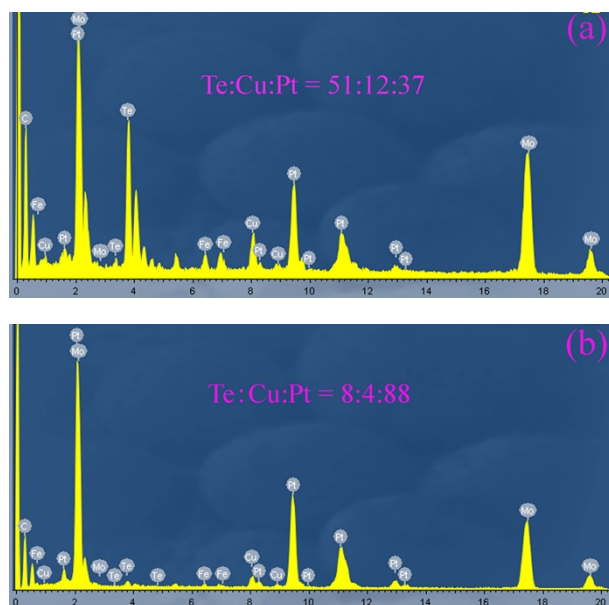


Figure S1. EDS of TeCuPt NWs (a) before and (b) after electrochemical dealloying.

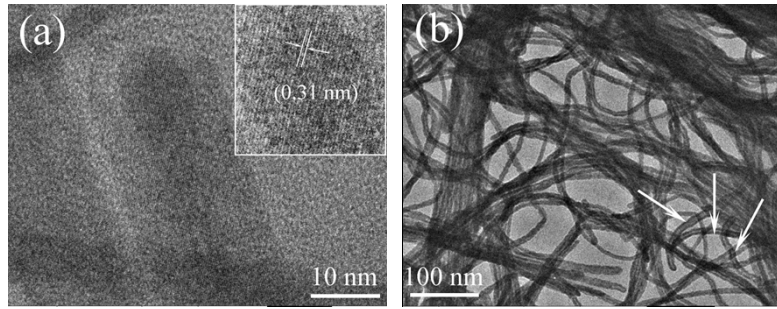


Figure S2. TEM image of TeCuPt NWs before (a) and after (b) KOH treatment. The inset of (a) shows the HRTEM image of Te core. The arrows in (b) indicate the presence of TeCuPt NTs.

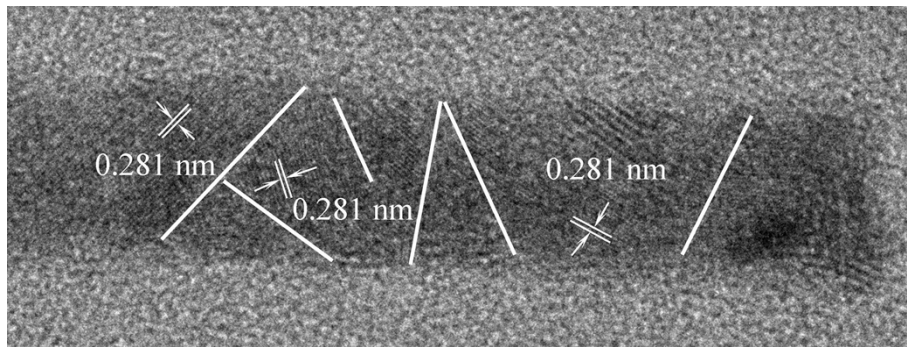


Figure S3. HRTEM image of a ternary TeCuPt NW after KOH treatment.

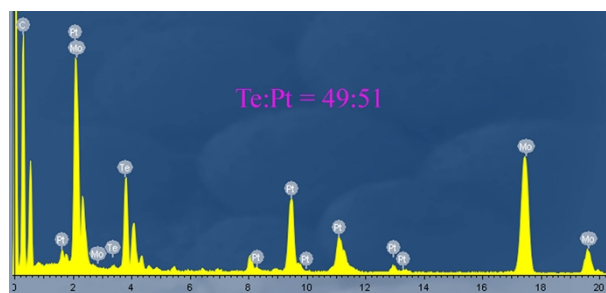


Figure S4. EDS of TePt NTs.

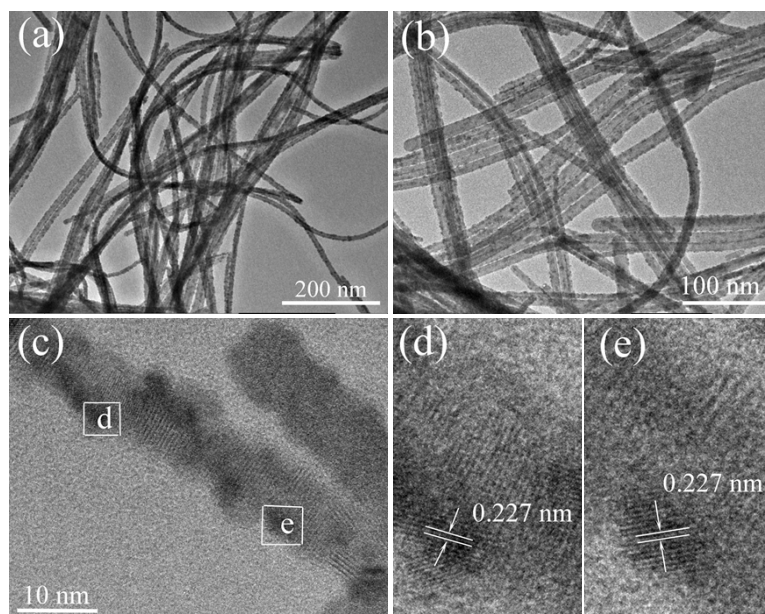


Figure S5. (a, b) TEM and (c-e) HRTEM images of ternary TeCuPt alloy obtained by fast injection of CuSO_4 and H_2PtCl_6 .

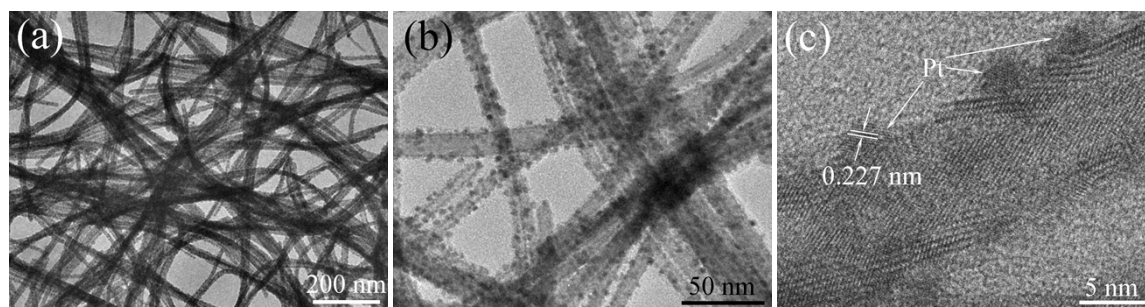


Figure S6. (a, b) TEM and (c) HRTEM images of binary TePt alloy obtained by fast injection of H_2PtCl_6 .

In order to well explain how Cu^{2+} being reduced to Cu, we did following supplementary experiments. 0.5 g AA was firstly dissolved in 20 mL H_2O (Figure S7a), then 0.03g $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ was added. The color of AA solution immediately became yellow (Figure S7b), implying the reaction between Cu^{2+} and AA. When 0.03 g KI was added to the mixed solution of Cu^{2+} and AA, milk white CuI precipitate (Figure S7c and Figure S8) immediately formed when Cu^+ contacted I^- for its low K_{sp}

($K_{sp_{CuI}} = 1.1 \times 10^{-12}$), and it well proved the formation of Cu^+ in the presence of AA. Combined with the XPS results, we could conclude that the Cu^{2+} was firstly reduced to Cu^+ by AA, then being further reduced to Cu by Te NWs.

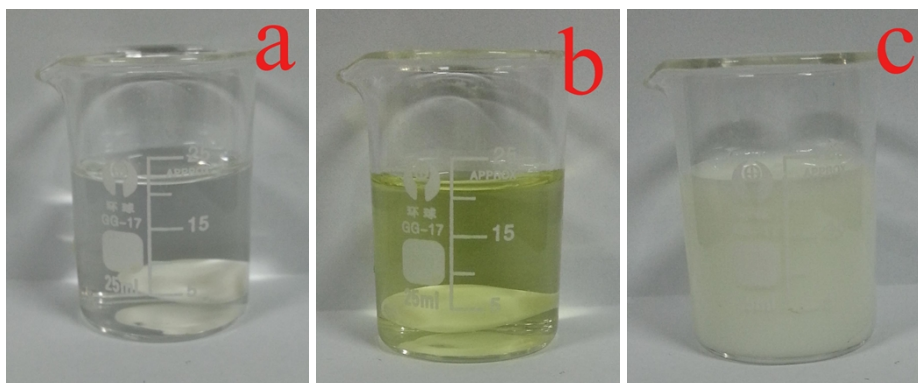


Figure S7. (a) AA solution containing 0.5 g AA; (b) 0.03g $CuSO_4 \cdot 5H_2O$ was added to solution (a); (c) 0.03 g KI was added to solution (b).

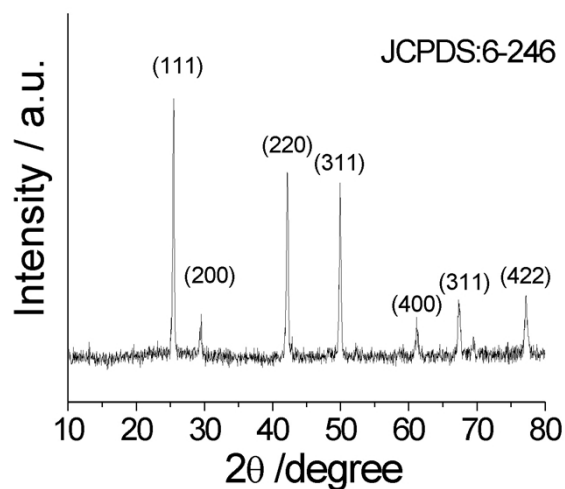


Figure S8. XRD pattern of white precipitates.

Figure S9a shows the XPS of Cu 2p CL region for TeCuPt NWs. It can be found that the Cu 2p spectrum exhibited two peaks at 932.7 ($Cu2p_{3/2}$) and 952.4 ($Cu2p_{1/2}$) eV, which was consistent with the previously reported Cu(0) 2p binding energy in Pt-Cu alloys (*ACS Appl. Mater. Interfaces* 2014, 6, 7301; *Chem. Commun.*, 2010, 46, 8989). Besides, the peak at 942 ($Cu2p_{3/2}$ sat) eV suggested the presence of Cu^{2+} ,

which maybe came from the oxidation of surface Cu or adsorbent Cu^{2+} . The signals for Cu L3VV Auger spectrum (Figure S9b) were poor, and a low peak at ~ 918.9 eV was observed, which was close to the reported kinetic energy (918.5 eV) for Cu(0) in literature (*Surf. Sci. Spectra*, 1994, 3, 202).

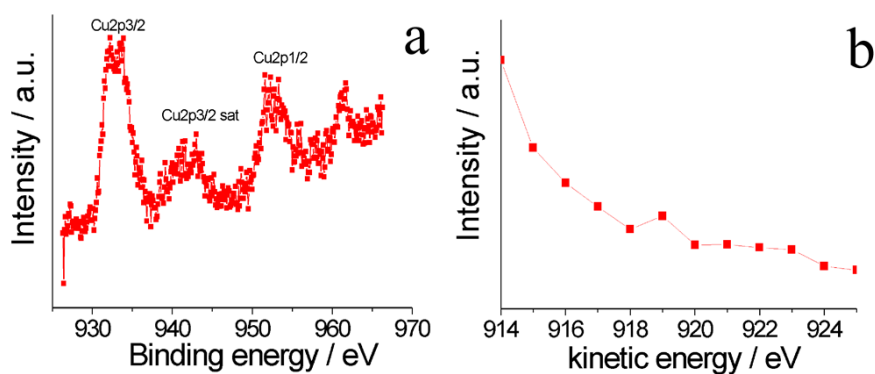


Figure S9. (a) XPS of Cu 2p CL region and (b) Cu L3VV Auger spectrum for TeCuPt NWs.

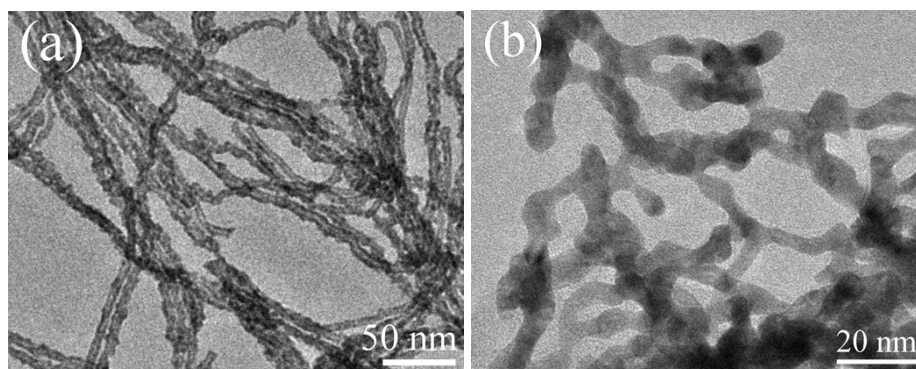


Figure S10. TEM images of TePt NTs (c) before and (b) after CV dealloying process.