Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Compressed hydrogen gas-induced synthesis of Au-Pt core/shell nanoparticle chains towards high-performance catalysts for Li-O_2 batteries

Cheng Chao Li,‡[a] Wenyu Zhang,‡[ac] Huixiang Ang,[a] Hong Yu,[ac]Bao Yu Xia,[b] Xin Wang,[b] Yanhui Yang,[b] Yang Zhao,[a] Huey Hoon Hng*[a] and Qingyu Yan*[acd]

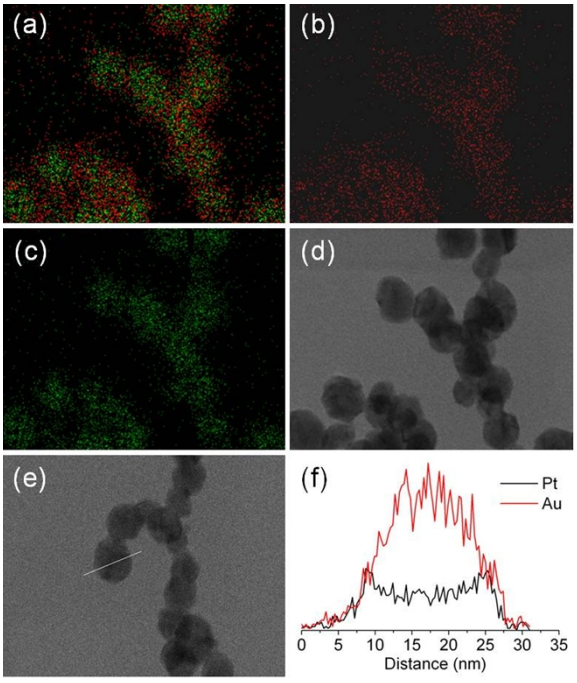

Figure SI-1 (a) The whole area mapping analysis of nanoparticles in bright field showing the distribution of Au and Pt in the synthesized Au/Pt core/shell chains. In (b) and (c) red and green dots represent Pt and Au respectively. (d) and (e) TEM images of the synthesized Au/Pt chains. (f) Distribution of components in the Au/Pt nanoparticles obtained by the line-scan analysis.

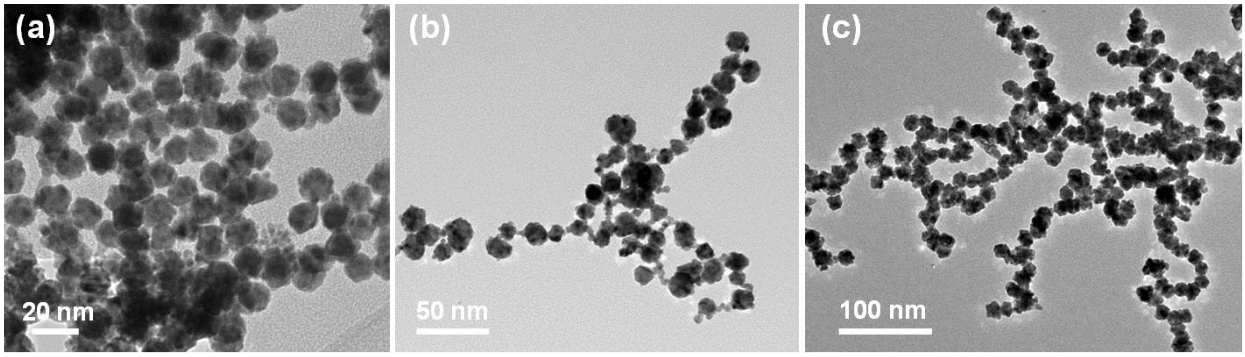

Figure SI-2 Au/Pt products synthesized at different dosage of H_2PtCl_4: (a) 0.1 mL, (b) 0.2 mL, (c) 0.5 mL.

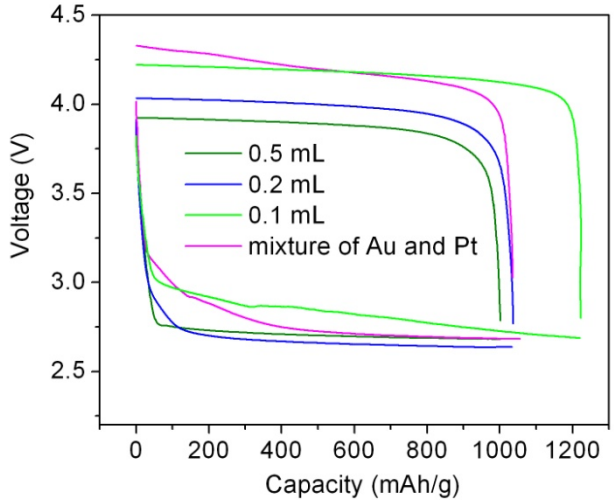

Figure SI-3 Charging and discharging voltage profiles of Au/Pt nanostructures electrodes prepared by different H_2PtCl_4 dosage at a current density of at100 mA/g.

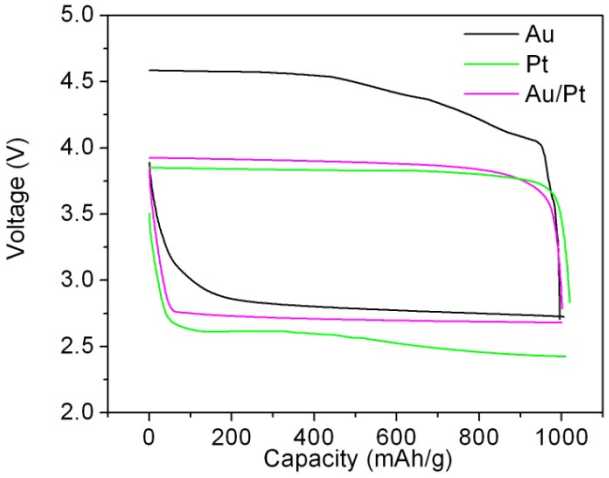

Figure SI-4 Charging and discharging voltage profiles of Au and Pt nanoparticles electrodes at a current density of at100 mA/g.

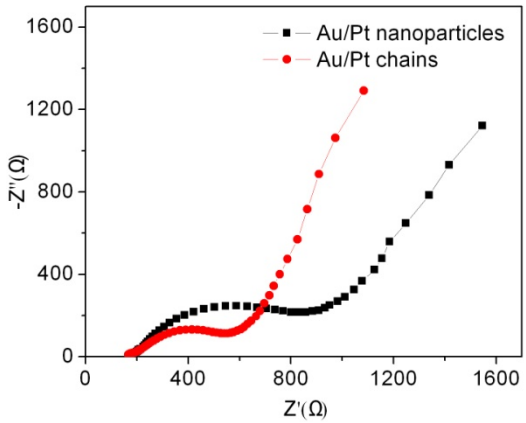

Figure SI-5. Impedance spectra of whole Li-O_2 cells based on Au/Pt nanostructures. Electrochemical impedance spectroscopy (EIS) examination was also carried out to clarify the difference in electron transfer efficiency of Au/Pt core/shell chains and separated nanoparticles. According to the follow equation:

$$Z^{'} = R_s + R_{ct} + \sigma\omega^{-1/2}$$

Where *Rs* is the ionic resistance of electrolytes; an intercept at the $Z^{'}$ axis in a high frequency region can correspond to *Rs*, whose value is usually small and similar; *Rct* is the charge transfer resistance, the combination of one compressed semicircle in the high-to-medium frequency range on the $Z^{'}$ axis is assigned to the charge-transfer impedance (approximately equal to *Rct*).σ is the Warburg factor, which is associated with the diffusion of the electroactive species to the electrode; and ω is the angular

frequency ($\omega = 2\pi f$); the inclined line in the low frequency region represents the Warburg impedance ($\sigma\omega^{-1/2}$). Clearly, the diameter of the semicircle for the Au/Pt core/shell chains electrode in the high-medium frequency regain is much smaller than that of the separated nanoparticles electrode, revealing that the Au/Pt core/shell chains electrode possess lower contact and charge-transfer impedances.