Electronic Supplementary Information

Core-Shell CdSe@Pt Nanocomposites with Superior Electrocatalytic Activity Enhanced by Lateral Strain Effect

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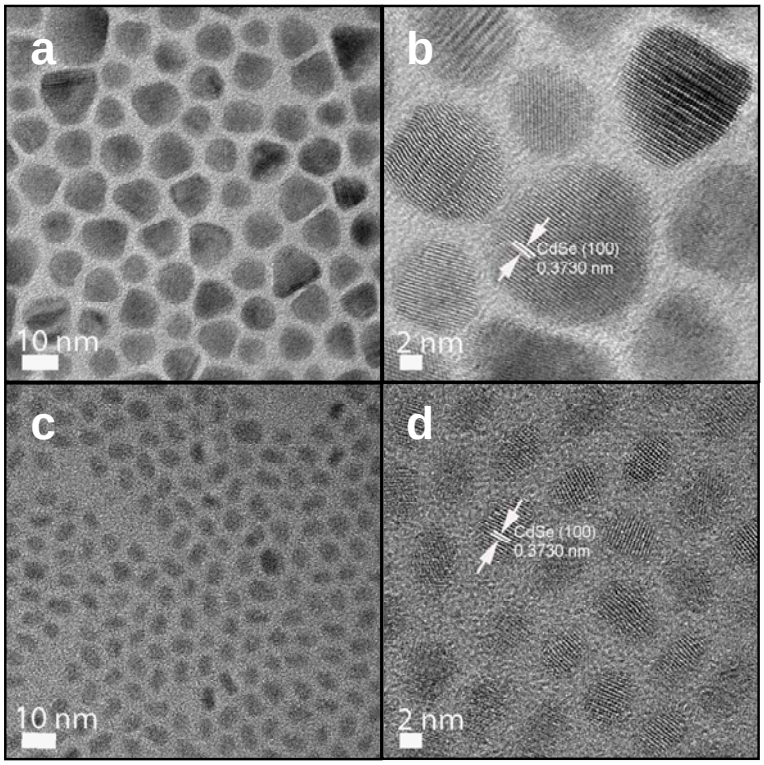

Fig. S1 CdSe nanocrystals as-prepared: (a, c) TEM and (b, d) HRTEM images of CdSe nanocrystals with average sizes of (a, b) 10 nm and (c, d) 5 nm, respectively.

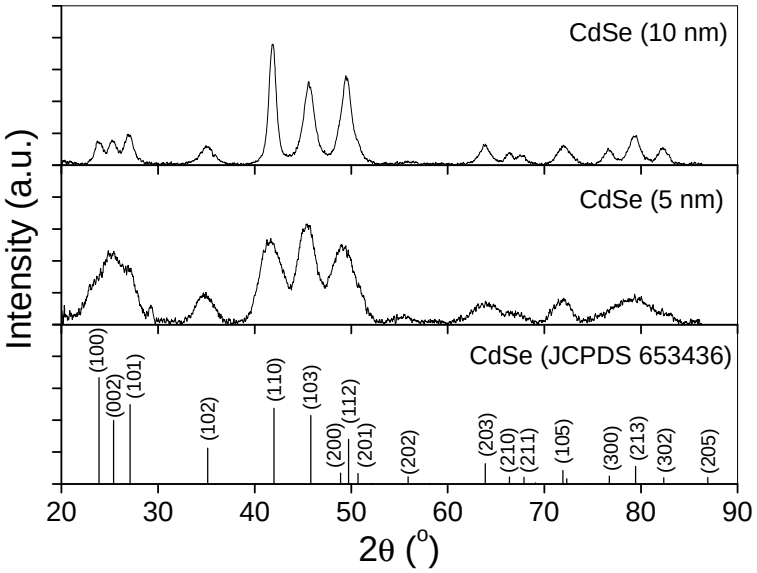

Fig. S2 XRD patterns of CdSe nanocrystals of different sizes and CdSe reference (JCPDS 653436).

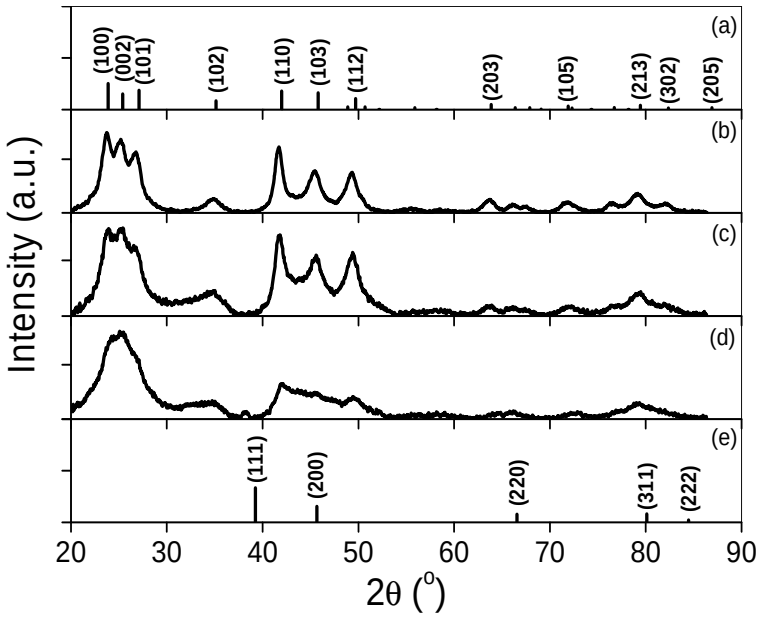

Fig. S3 XRD patterns core-shell CdSe@Pt nanocomposites synthesized using 10 nm CdSe cores: (a) CdSe reference (JCPDS 653436, d(110) = 0.2150), (b, c, d) core-shell CdSe@Pt nanocomposites at CdSe/Pt molar ratio of 2/1, 1/1, and 1/2, respectively, and (e) Pt reference (JCPDS 882343, d(111) = 0.2292).

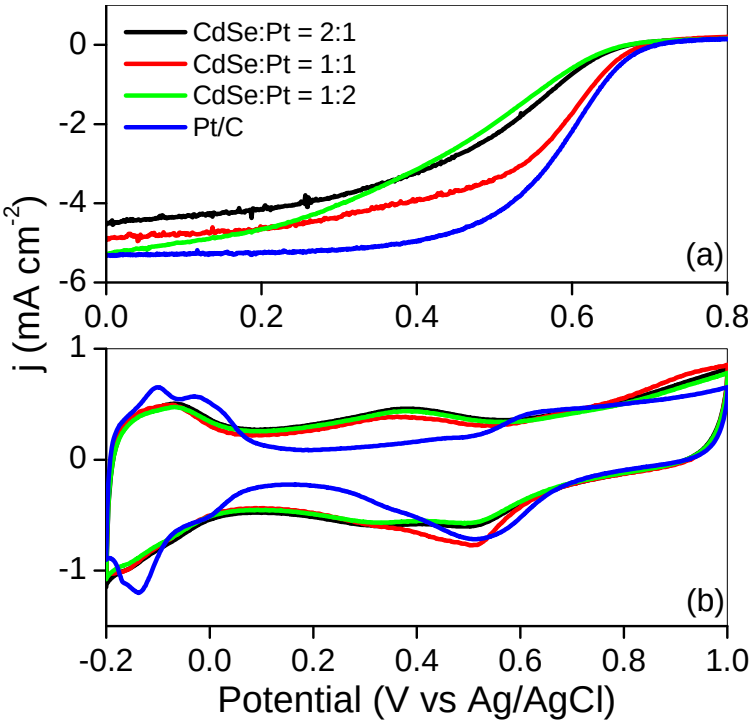

Fig. S4 Electrochemical characterization of the core-shell CdSe@Pt nanocomposites synthesized using 10 nm CdSe cores: (a) ORR polarization curves for the core-shell CdSe@Pt nanocomposites at different CdSe/Pt molar ratios and commercial Pt/C catalysts, recorded at room temperature in an O_2-saturated $HClO_4$ solution (0.1 M) at a sweep rate of 20 $mV \cdot s^{-1}$ and a rotating speed of 1600 rpm; (b) Cyclic voltammograms of core-shell CdSe@Pt nanocomposites at different CdSe/Pt molar ratios and commercial Pt/C catalysts in argon-purged $HClO_4$ (0.1 M) at room temperature. Sweep rate = 50 mV s^{-1}.

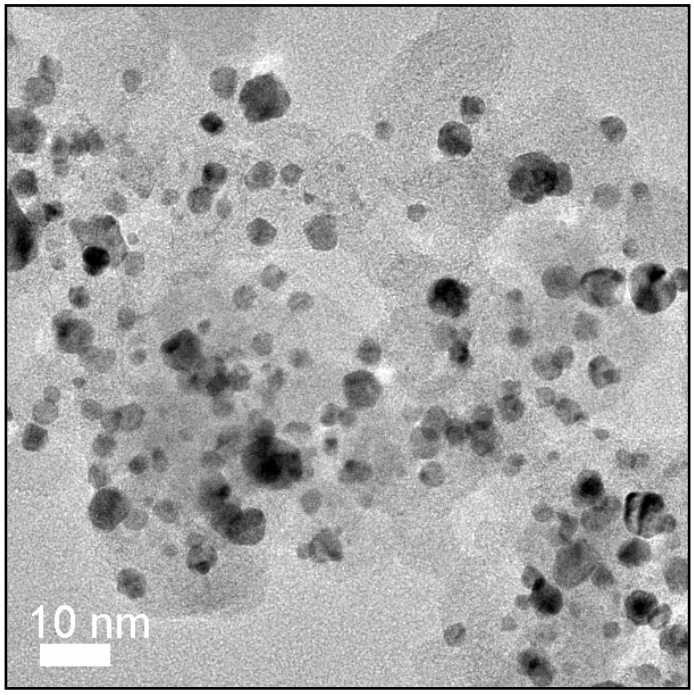

Fig. S5 TEM image of the Pt/C (E-TEK) catalysts, which consisted of ~3.2 nm Pt nanoparticles (20 wt%) on Vulcan XC-72 carbon support.

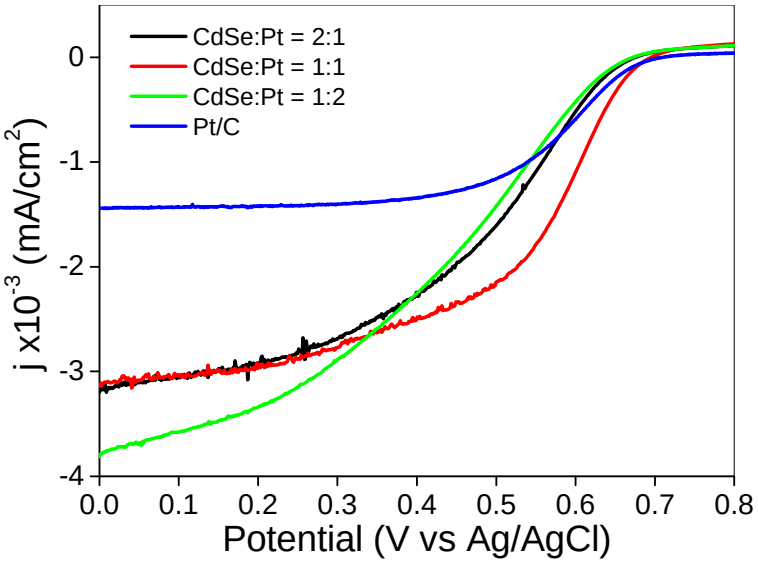

Fig. S6 ECSA-specific ORR polarization curves for the core-shell CdSe@Pt nanocomposites at different CdSe/Pt molar ratios and commercial Pt/C catalysts, recorded at room temperature in an O_2-saturated $HClO_4$ solution (0.1 M) at a sweep rate of 20 $mV \cdot s^{-1}$ and a rotating speed of 1600 rpm.

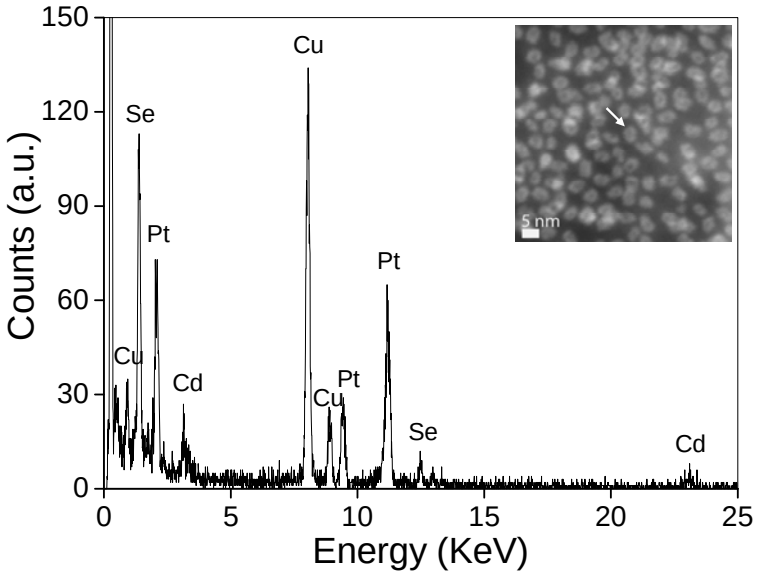

Fig. S7 EDX analysis of single core-shell CdSe@Pt nanocomposite labeled in the inset STEM image.

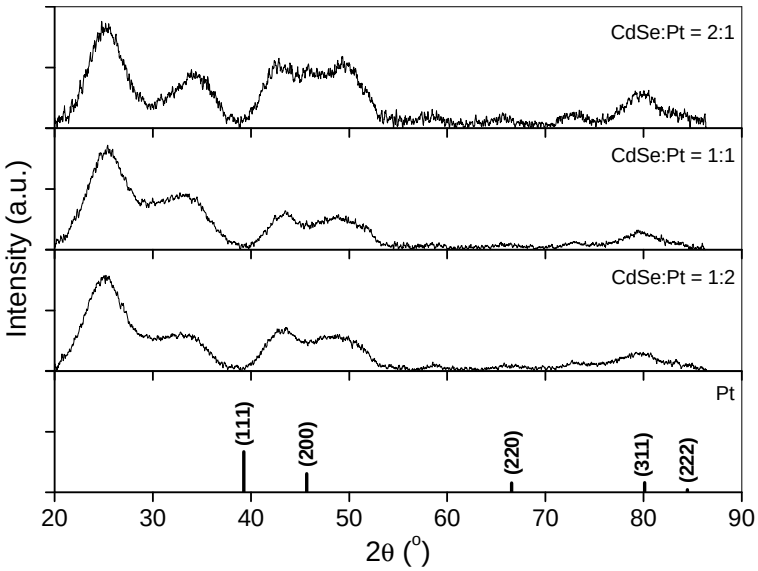

Fig. S8 XRD patterns core-shell CdSe@Pt nanocomposites using 10 nm CdSe cores at different CdSe/Pt molar ratios and Pt reference.

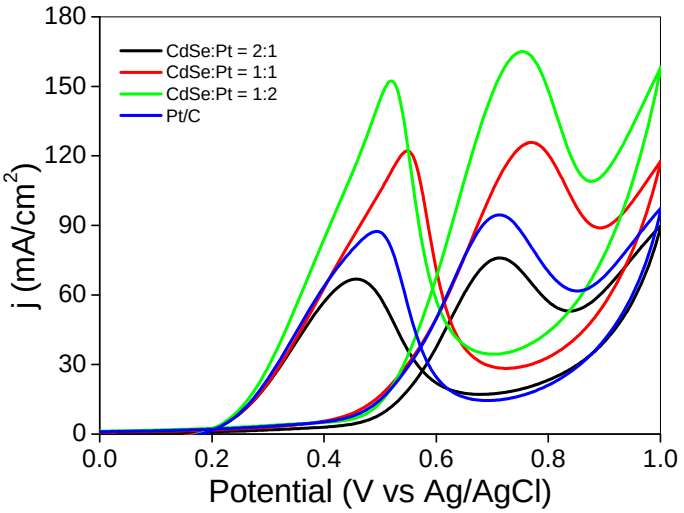

Fig. S9 Cyclic voltammograms of core-shell CdSe@Pt nanocomposites synthesized using 5 nm CdSe cores in argon-purged $HClO_4$ (0.1 M) with methanol (1 M). Sweep rate: 20 mV s^{-1}; room temperature.

Table S1 Electrochemical measurements of methanol oxidation on small core-shell CdSe@Pt nanocomposites and commercial Pt/C catalysts.

Materials	Forward scan peak potential (V)	Forward scan peak current density ($mA \cdot cm^{-2}$)	Backward scan peak potential (V)	Backward scan peak current density ($mA \cdot cm^{-2}$)
CdSe@Pt (2/1)	0.71	76.3	0.46	67.0
CdSe@Pt (1/1)	0.77	126.4	0.55	122.3
CdSe@Pt (1/2)	0.75	165.8	0.52	152.3
Pt/C	0.71	95.2	0.50	87.4