## **Copper(I) as reducing agent for the synthesis of bimetallic PtCu catalytic nanoparticles**

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Figure S1. (a) UV–Vis spectra of the interaction of K<sub>2</sub>PtCl<sub>4</sub> with CuBr and EDTA (molar ratio Pt/Cu = 1/6 and Pt/Cu/EDTA= 1/6/10) at 22°C. (b) colour of the Cu+Pt dissolution before adding EDTA, c) colour of the Cu+Pt dissolution after adding EDTA and d) colour of the supernatant Cu(II)-EDTA with the band cantered at 732 nm.



**Figure S2.** (a, b) DLS spectra of the interaction of K<sub>2</sub>PtCl<sub>4</sub> with CuBr and EDTA (molar ratio Pt/Cu = 1/6 and Pt/Cu/EDTA= 1/6/10) at 40 °C and 60 °C. (c, d) DLS spectra of the interaction of K<sub>2</sub>PtCl<sub>4</sub> with CuBr and EDTA (molar ratio Pt/Cu = 1/3 and Pt/Cu = 1/6) at 60 °C.



Figure S3.  $\zeta$ -Potential of the PtCu1 and PtCu2 in water after the centrifugation cycles.



**Figure S4.** (a-b) line-scanning profiles recorded along the path marked by the yellow line (a) (platinum green line and copper red line) and (c) the EDS spectrum.



**Figure S5.** HRTEM image of PtCu1, (b) representative lattice fringe under higher magnification and (c) determination of the inter-planar distance using plot profile.



**Figure S6.** HRTEM of PtCu1 and the corresponding FFT showing spots assigned to Pt (111) (marked as blue), Cu (111) (marked as red) and PtCu (200) (marked as green).



Figure S7. PtCu1 High-resolution XPS spectra of a) Pt4f and b) Cu2p



**Figure S8.** HRTEM of PtCu2 and the corresponding FFT showing spots assigned to Pt (111) (marked as blue) and Cu (111) (marked as red).



Figure S9. EDS spectra of PtCu2, showing the presence of Pt and Cu in the final nanoparticles. The gold signal is due to the tem grid.



Figure S10.

Figure S10. PtCu2 High-resolution XPS spectra of a) Pt4f and b) Cu2p.

**ICP** analysis

Digestion procedure

1 mL of sample was added to 50 mL of Mili-Q water. The sample was kept in agitation during 16 h. It was added  $1.0 \pm 0.1$  mL conc. HNO<sub>3</sub> and  $0.50 \pm 0.05$  mL conc. HCl to each sample. The samples were digested for 3 hours  $95 \pm 5^{\circ}$ C. After 3 hours at  $95 \pm 5^{\circ}$ C, the samples were taken from heat source and let cool for at least 30 minutes. The volume of the samples was reconstituted to 50 mL with Mili-Q water.

Table S1. ICP results of PtCu1 and PtCu2 nanomaterials

Sample	Cu [ppm]	Pt [ppm]
PtCu1	52	150
PtCu2	48	110