Supplementary Information for

Size Dependence Oxygen Reduction and Methanol Oxidation Reactions Catalytic Activities of PtCu Octahedral Nanocrystals

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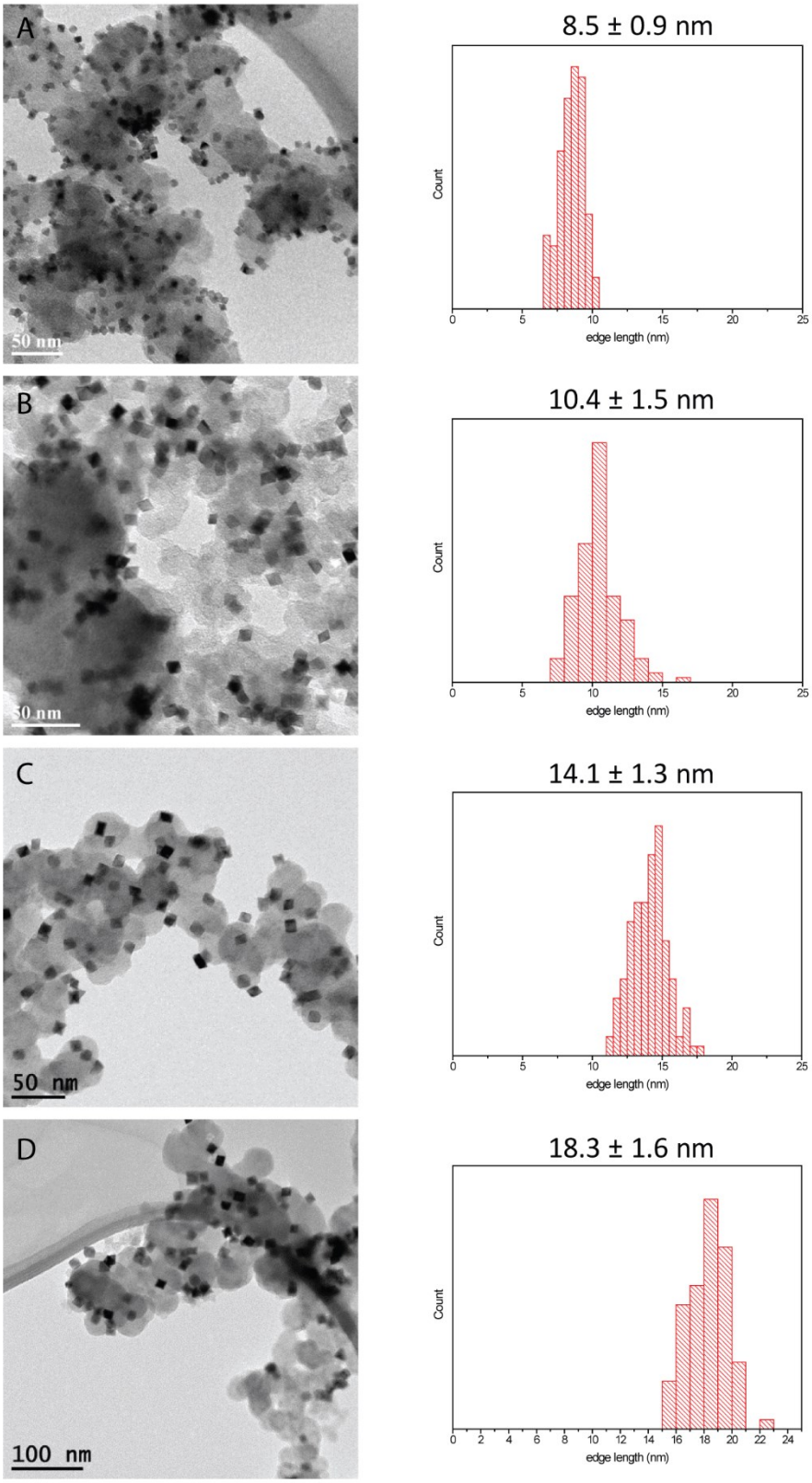

Figure S1. TEM images and PSD histogram for CuPt/C octahedral NPs: PtCu-8, PtCu-10, PtCu-14 and PtCu-18 (A-D respectfully).

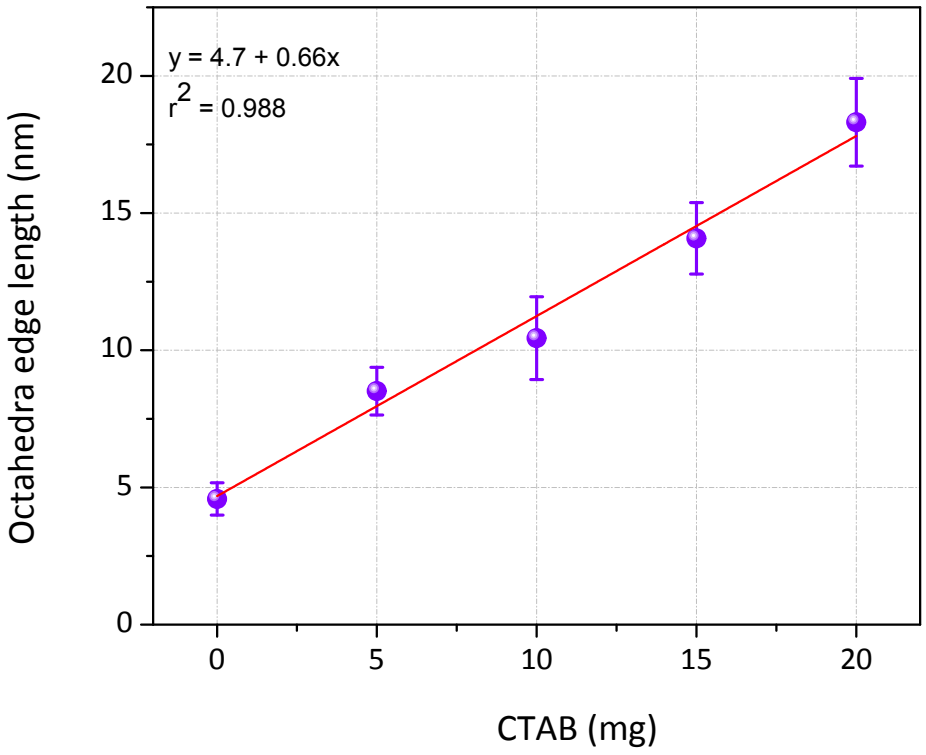

Figure S2. Dependence of particle mean size on different amounts of CTAB (purple dots) and the corresponding linear fit (red line).

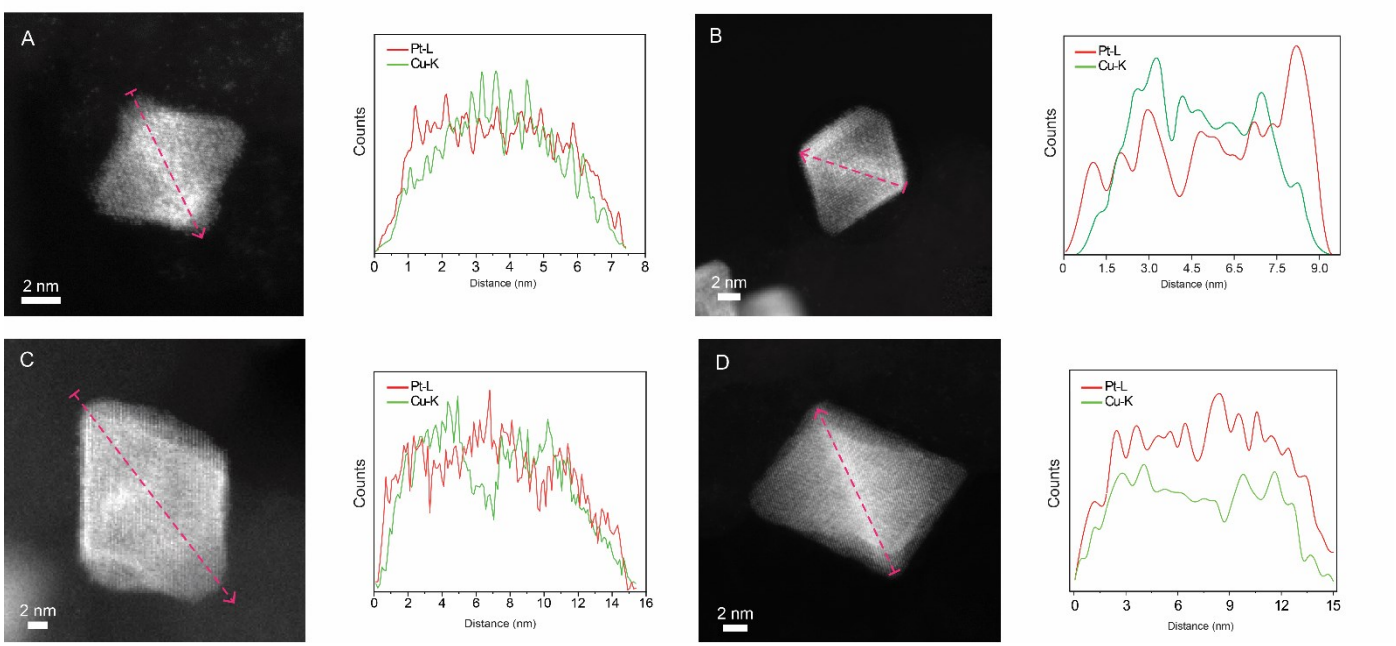

Figure S3. HAADF-STEM images and EDX line scan for PtCu-8, PtCu-10, PtCu-14 and PtCu-18 (A-D respectively).

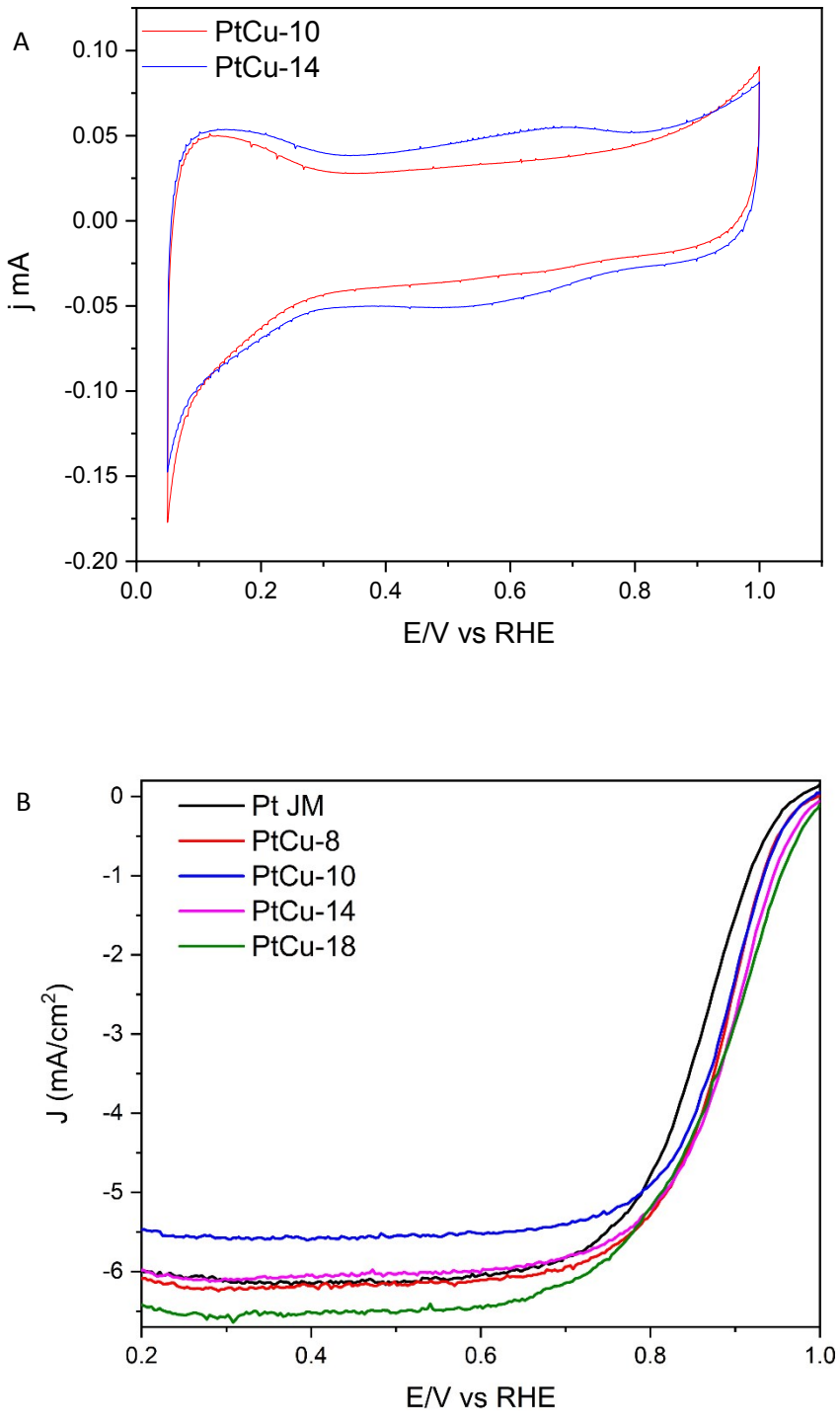

Figure S4. (A) CVs recorded at room temperature in an Ar-saturated and 0.1 M HClO4 solution with a sweep rate of 100 mV s-1. (B) ORR polarization curves recorded at room temperature in an O2-saturated 0.1 M HClO4 aqueous

solution with a sweep rate of 10 mV s-1 and a rotation rate of 1600 rpm normalized over the geometric surface area of the working electrode.

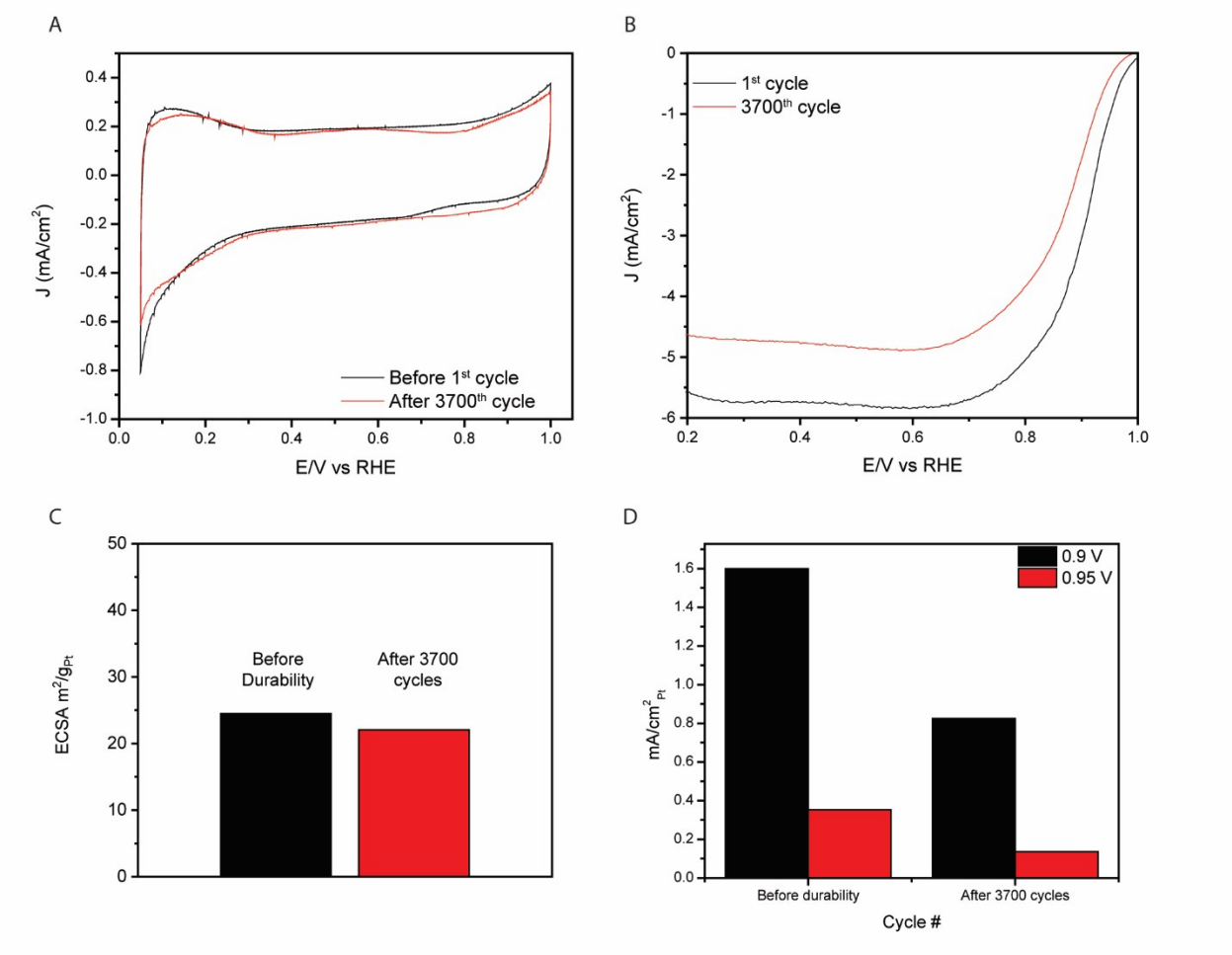

Figure S5. (A) CVs of PtCu-18 recorded before (black) and after (red) the durability test with a sweep rate of 100 mV s-1. (B) ORR polarization curves recorded with a sweep rate of 10 mV s-1 and a rotation rate of 1600 rpm; before (black) and after (red) the durability test. (C) Electrochemical surface area associated with the CVs in (A). (D) Specific activity for the ORR at 0.9 and 0.95 V; before (black) and after (red) the durability test.

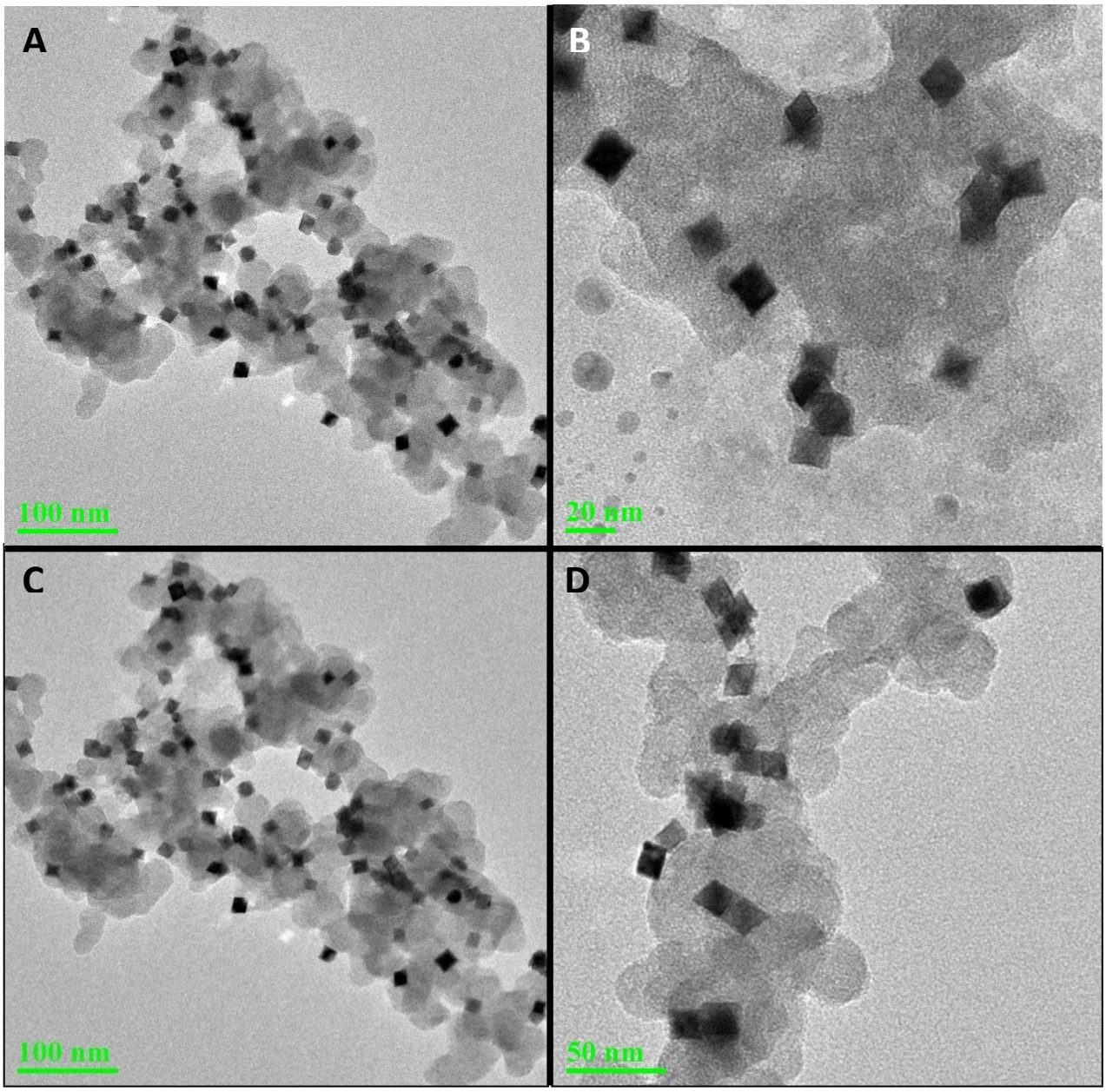

Figure S6. TEM images for PtCu-18 octahedral NPs obtained from the catalyst layer on the working electrode, (A & B) after the durability test and (C & D) after CO-stripping test.

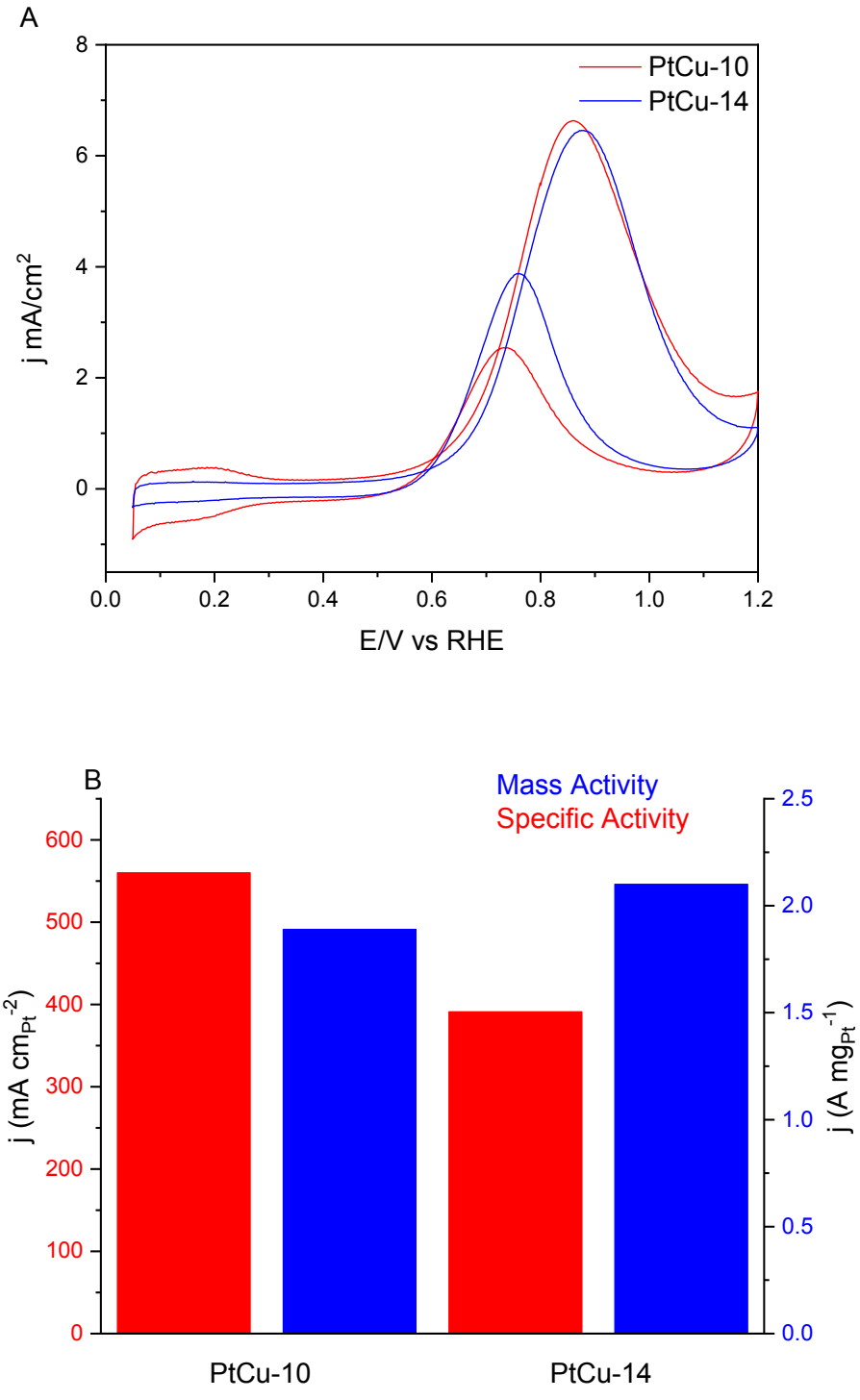

Figure S7. (A) CVs recorded at room temperature in the mixture of 0.1 M HClO4 and 0.1 M CH3OH solution with a sweep rate of 100 mV/s. (B) Specific and mass activity for the MOR for PtCu-10 and PtCu-14.

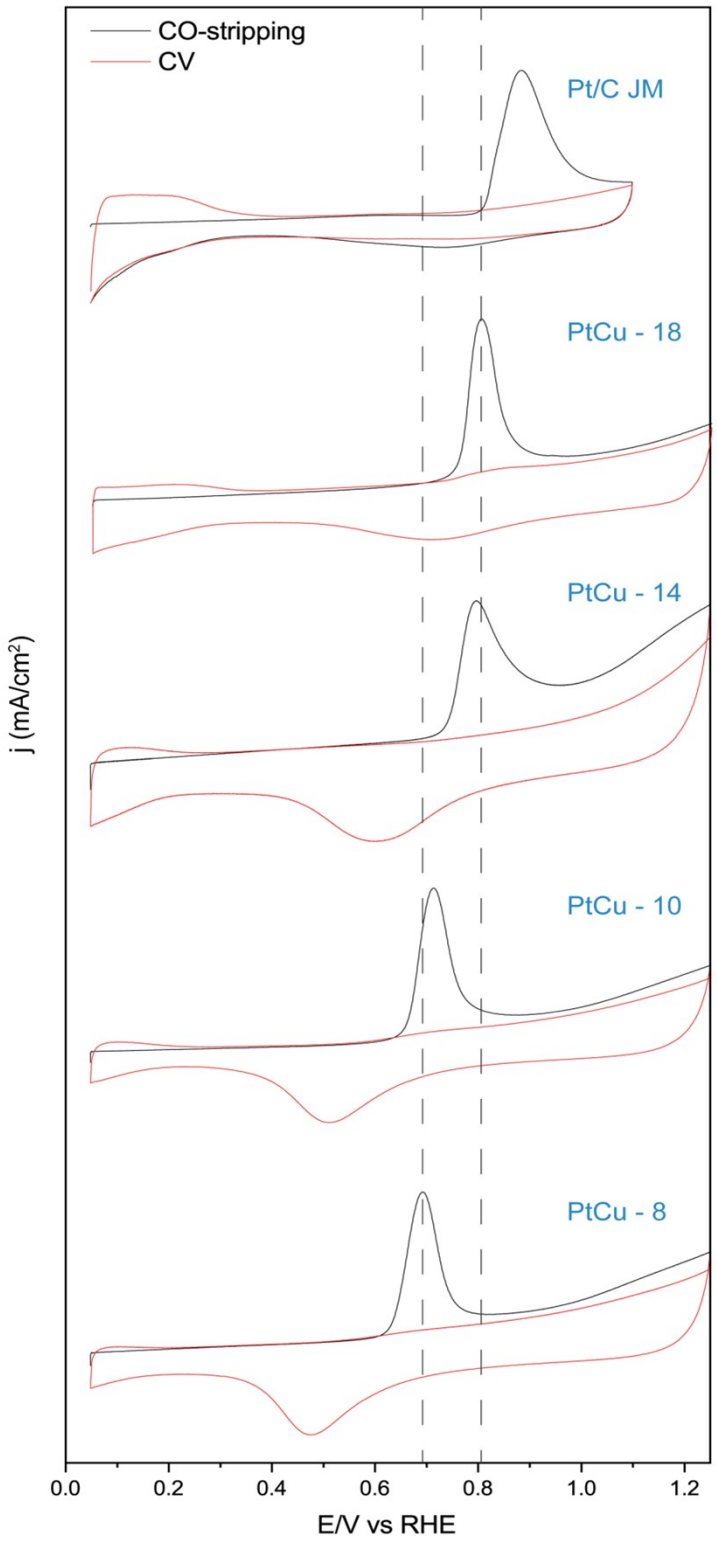

Figure S8. CO-stripping curve (black lines) and the following cyclic voltammetry curve (red lines) in Ar-saturated 0.1 M $HClO_4$ solution at a scanning rate of 100 mV s^{-1}.

Equation 1. formula for calculating the strain on the Pt surface where a_{Pt} is the bulk Pt lattice parameter. Taking from reference [1]

$$s(Pt) = \frac{ashell - aPt}{aPt}$$

References

(1) Strasser, P.; Koh, S.; Anniyev, T.; Greeley, J.; More, K.; Yu, C.; Liu, Z.; Kaya, S.; Nordlund, D.; Ogasawara, H.; Toney, M. F.; Nilsson, A. Lattice-Strain Control of the Activity in Dealloyed Core-Shell Fuel Cell Catalysts. *Nat. Chem.* **2010**, *2* (6), 454–460. https://doi.org/10.1038/nchem.623.