

Supporting Information

The Difference in Electrocatalytic Activity between Pt(110)-(1×2) and Pt(110)-(1×1) Surfaces for Methanol Electrooxidation in an Acidic Medium

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1. Cyclic voltammograms of flame-annealed Pt(110) after cooling in different atmospheres

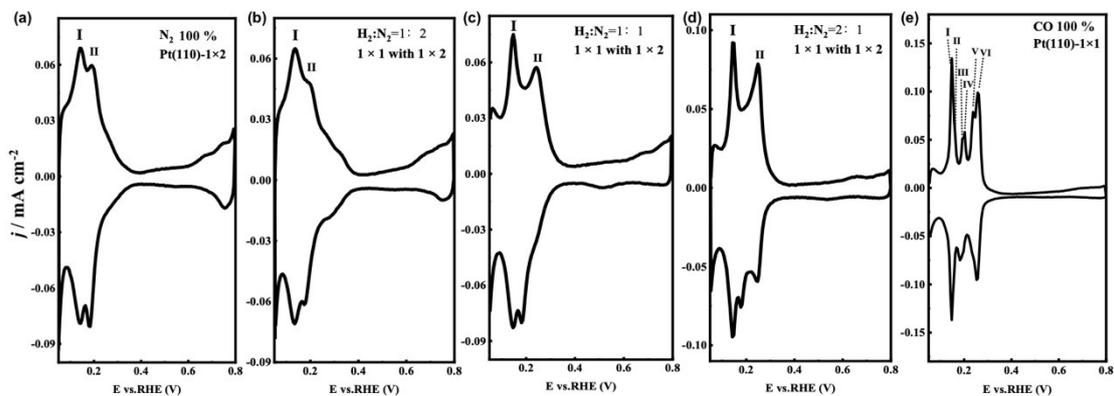


Figure S1. Cyclic voltammetry of flame-annealed Pt(110) cooled by different gas mixtures in 0.1 M HClO₄ solution. (a) Pt(110)–(1×2), 100% N₂; (b) Mixed Pt(110)–(1×1,1×2), H₂/N₂=1:2; (c) Mixed Pt(110)–(1×1,1×2), H₂/N₂=1:1; (d) Mixed Pt(110)–(1×1,1×2), H₂/N₂=2:1; (e) Pt(110)–(1×1), H₂/N₂ = 1:5. The scan rate is 50 mV/s.

2. *In situ* electrochemical FTIR cell

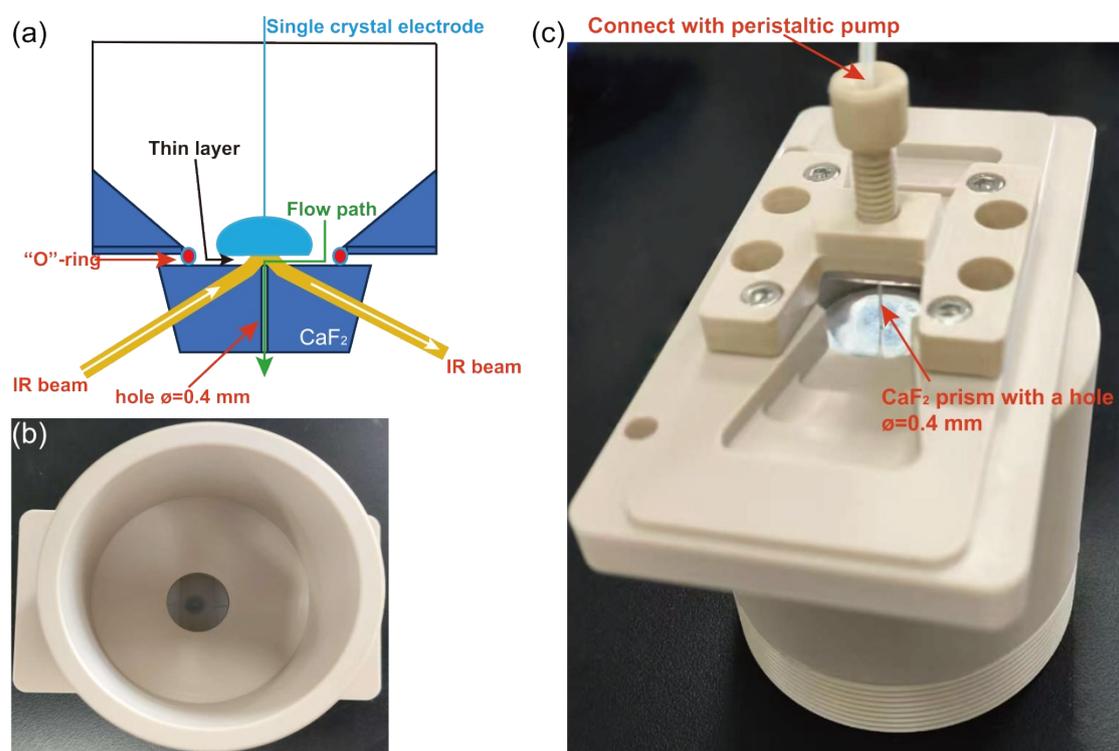


Figure S2. Images of the *in situ* FTIR cell. (a) Schematic cross-sectional side view of the *in situ* FTIR cell; (b) Top view of the *in situ* FTIR cell; (c) Detailed view of the CaF₂ window and electrolyte solution flow path at the cell base.

3. Potential of zero total charge (PZTC) determination for three Pt(110) surfaces via CO displacement

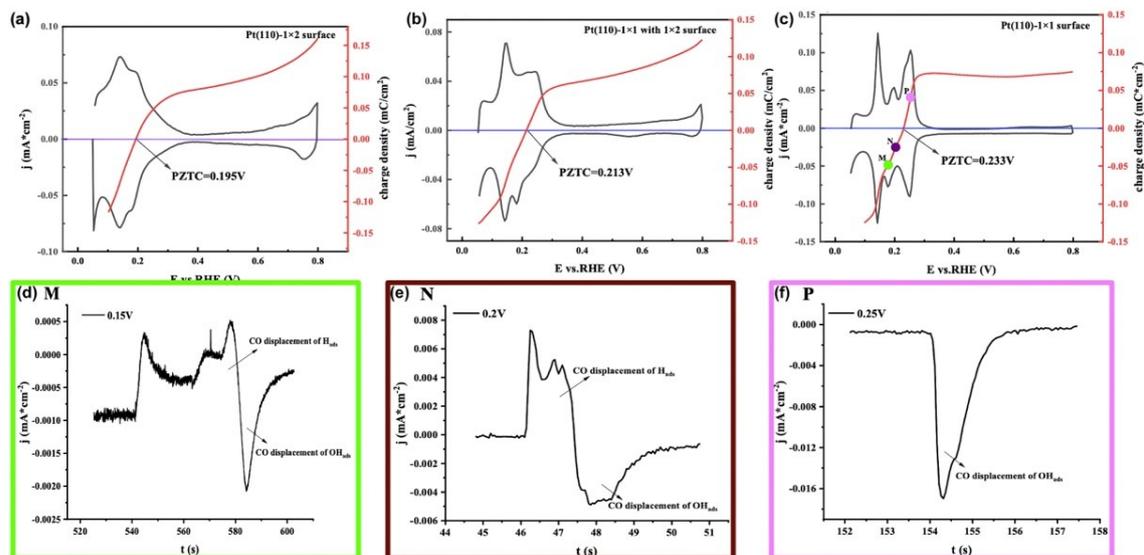


Figure S3. Determination of the potential of zero total charge (PZTC) for the (a) Pt(110)–(1×2), (b) mixed Pt(110)–(1×1,1×2), and (c) Pt(110)–(1×1) surfaces. (d–f) Time-dependent CO displacement curves at points of M (0.15 V), N (0.2 V), and P (0.25 V) on the Pt(110)–(1×1) surface.

4. The dependence of the charge densities of peaks I–III on methanol concentration for the Pt(110)–(1×1) electrode

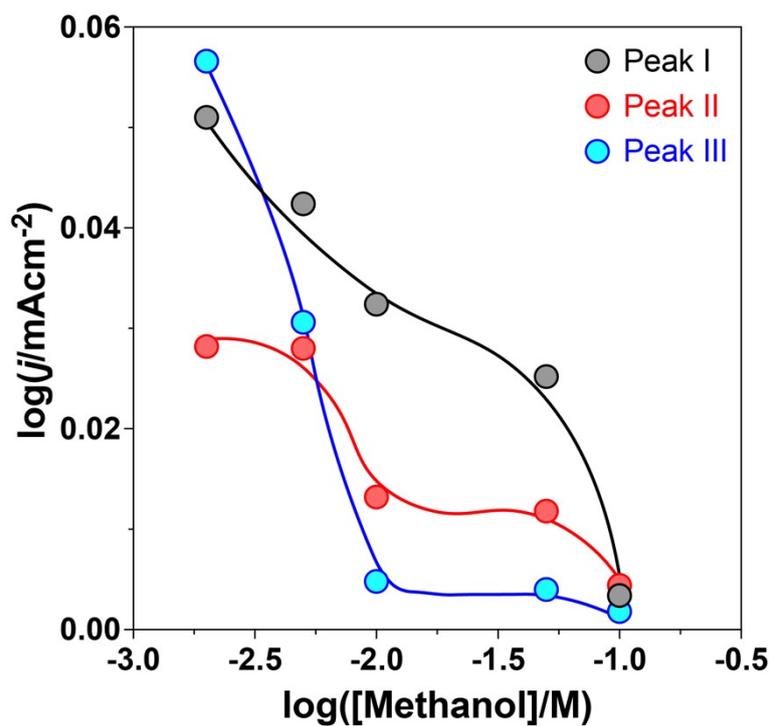


Figure S4. The dependence of the charge densities corresponding to peaks I, II, and III on the methanol concentration for the Pt(110)–(1×1) electrode in Figure 1e.

5. Positive scan profiles for methanol oxidation on Pt (110)–(1×1) surface at different scan rates

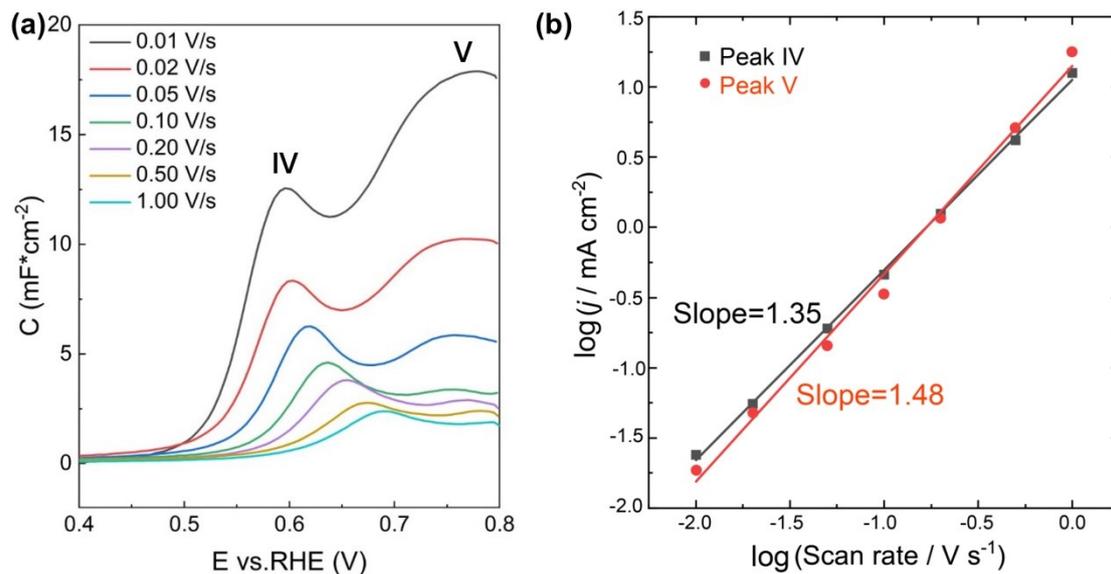


Figure S5. Effect of scan rate on the positive scans of the Pt(110)–(1×1) surface in 0.1 M HClO₄ containing 50 mM methanol over the potential range of 0.4–0.8 V (vs. RHE). (a) Dependent of C with potential, $C \text{ (mF cm}^{-2}\text{)} = j \text{ (mA cm}^{-2}\text{)}/\text{Scan rate (V/s)}$. (b) Linear relationship of $\log(j)$ with $\log(v)$.