Supporting Information for

Methane partial oxidation under periodic reaction conditions on Pt/Al₂O₃

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Figure S1. Reactor schematic.



Figure S2. (a) Schematic of cycling strategy 3. Reactor outlet profile at 450 °C for a feed mixture containing 2% CH₄ and 0.05% O₂ (b), 0.1% O₂ (c), 0.2% O₂ (d), 0.5% O₂ (e), 1% O₂ (f)



Figure S3. (a) Schematic of cycling strategy 1. Reactor outlet profile at 450 °C for a feed mixture containing 2% CH₄ and 0.05% O₂ (b), 0.1% O₂ (c), 0.2% O₂ (d), 0.5% O₂ (e), 1% O₂ (f)



Figure S4. (a) Schematic of cycling strategy 2. Reactor outlet profile at 450 °C for a feed mixture containing 2% CH₄ and 0.05% O₂ (b), 0.1% O₂ (c), 0.2% O₂ (d), 0.5% O₂ (e), 1% O₂ (f)



Figure S5. Feed utilization and hydrogen selectivity during various cycles with varying oxygen content in the feed mixture for cycling strategy 2.



Figure S6. CO titration schematic along with reactor outlet profile at 450 °C.



Figure S7. Amount of CO₂ and H₂ producing during the CO titration experiment.



Figure S8. Pt nanorod model on fully hydrated alumina support with one CO molecule adsorbed in the most stable position near the Pt/Al₂O₃ interface corresponding to state B in Figs. 7 and 8 of the main text.