

Supplementary Information for:

Kinetic Analysis to Describe Co-operative Redox Enhancement Effects Exhibited by Bimetallic Au-Pd Systems in Aerobic Oxidation

Isaac T. Daniel,¹ Liang Zhao,¹ Donald Bethell,¹ Mark Douthwaite,^{1*} Samuel Pattison,¹ Richard J. Lewis,¹ Ouardia Akdim,¹ David J. Morgan,¹ Steven McIntosh² and Graham J. Hutchings^{1*}

¹Max Planck-Cardiff Centre on the Fundamentals of Heterogeneous Catalysis FUNCAT, Cardiff Catalysis Institute, School of Chemistry, Cardiff University, Main Building, Park Place, Cardiff, CF10 3AT (UK)

²Department of Chemical and Biomolecular Engineering, Lehigh University, Bethlehem, PA, USA

*Correspondence to Mark Douthwaite (douthwaitejm@cardiff.ac.uk) and Graham J. Hutchings (hutch@cardiff.ac.uk).

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Table S1. ICP-AES analysis for Au/C and Pd/C catalysts that had a target metal loading of 1 wt.%. Synthesis by a sol-immobilisation procedure. Catalysts were initially digested via microwave prior to analysis.

Catalyst ID	Weight percent (%)
Pd/C	1.041
Au/C	1.013

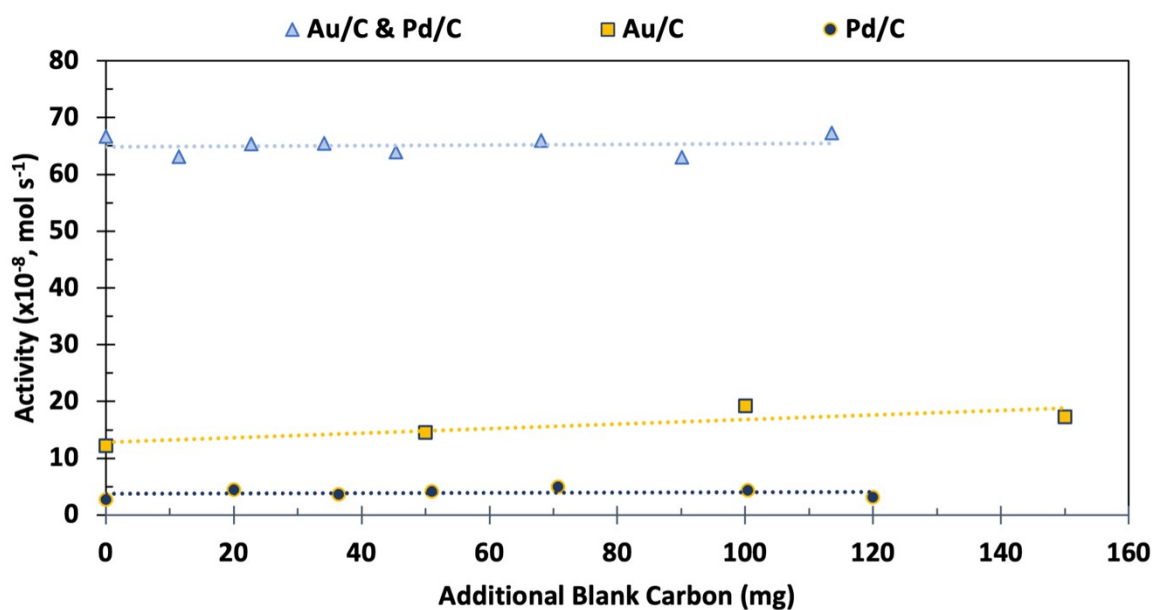


Figure S1. The effect on activity (eq. 15) of the addition of blank carbon to carbon supported Au, Pd or Au & Pd catalytic systems. Reaction conditions: H₂O (16 mL), HMF (0.1 M), NaHCO₃ (0.4 M), 3 bar O₂, 80 °C, 30 minutes, HMF mol : metal mol = 200 : 1 in the bimetallic system and 400 : 1 in the monometallic systems. Catalyst masses are constant throughout: 1.75 wt.% Au/C (72.1 mg), 0.25 wt.% Pd/C (68 mg). Note that these catalysts differ from those presented in the main body, hence activities are not directly comparable.

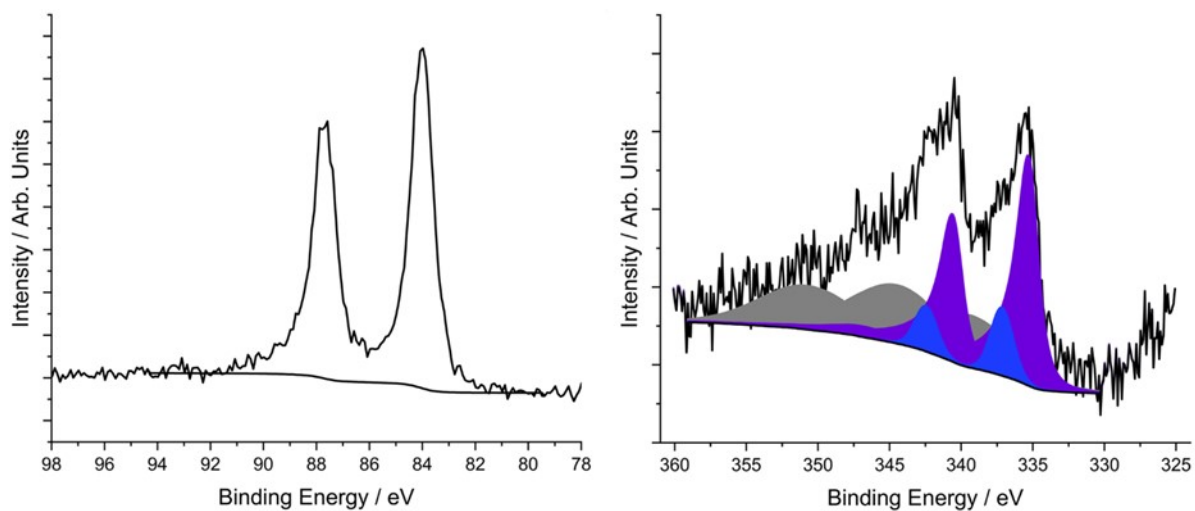


Figure S2. From left, XPS data for the Au $4f$ region and Pd $3d$ region for fresh 1 wt.% Au/C and 1 wt.% Pd/C, respectively. Key for Pd spectrum: Pd 0 components (purple); Pd $^{2+}$ components (blue); carbon loss structure (grey).

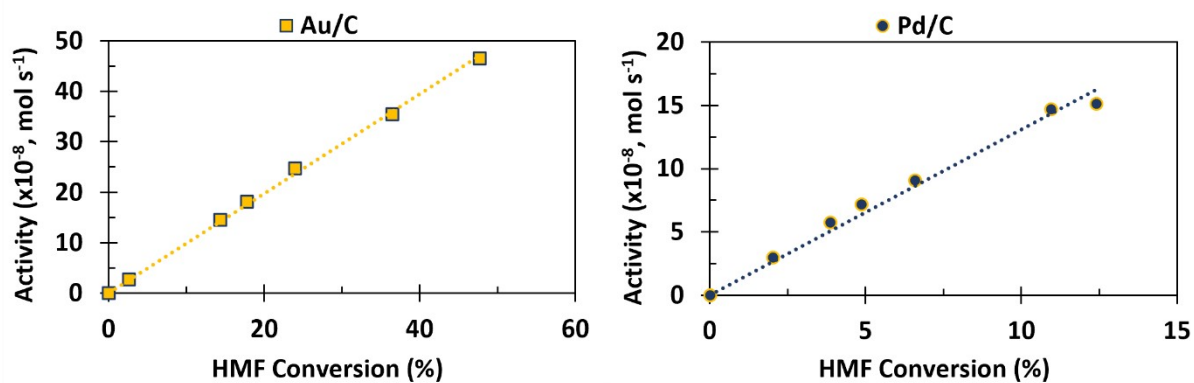


Figure S3. The consistent correlation between HMF conversion and activity for monometallic 1 wt.% Au/C and 1 wt.% Pd/C, respectively. Trends shown in the main text for activity can also be shown with HMF conversion. Reaction conditions: H $_2$ O (16 mL), HMF (0.1 M), NaHCO $_3$ (0.4 M), 3 bar O $_2$, 80 °C, 30 minutes.

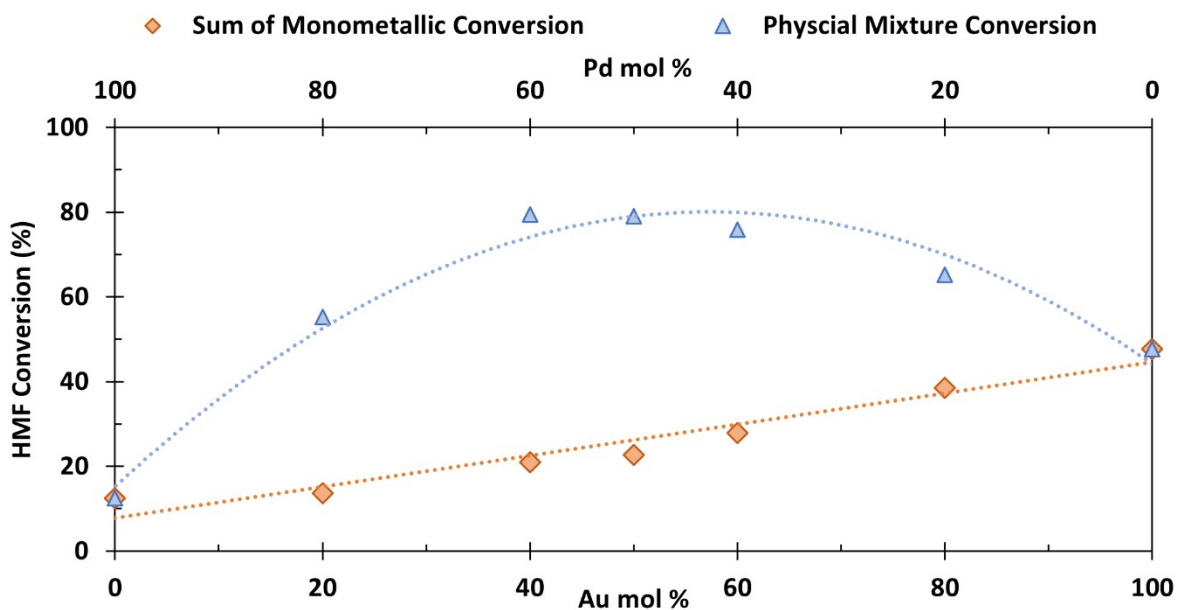


Figure S4. The sum of monometallic HMF conversions compared to physical mixture conversions for 1 wt.% Au/C and 1 wt.% Pd/C at various molar ratios. The total metal content is constant throughout the physical mixture system. The sum of monometallic conversions is calculated from the monometallic conversion of 1 wt.% Au/C and 1 wt.% Pd/C at each specific catalyst amount. Error bars represent +/- standard deviation for N = 2. Reaction conditions: H₂O (16 mL), HMF (0.1 M), NaHCO₃ (0.4 M), 3 bar O₂, 80 °C, 30 minutes, HMF mol : metal mol = 200 : 1 for 100 mol%.