

The direct synthesis of hydrogen peroxide over Au-Pd supported nanoparticles under ambient conditions.

Alba Santos,^[a] Richard J. Lewis,^[a] Grazia Malta,^[a] Alexander G. R. Howe,^[a] David J. Morgan,^[a] Euan Hampton,^[b] Paul Gaskin^[b] and Graham J. Hutchings^{*[a]}

^aCardiff Catalysis Institute, School of Chemistry, Cardiff University, Main Building, Park Place, Cardiff, CF10 3AT, United Kingdom.

^bDŵr Cymru Welsh Water, Pentwyn Road, Nelson, Treharris, CF46 6LY, United Kingdom.

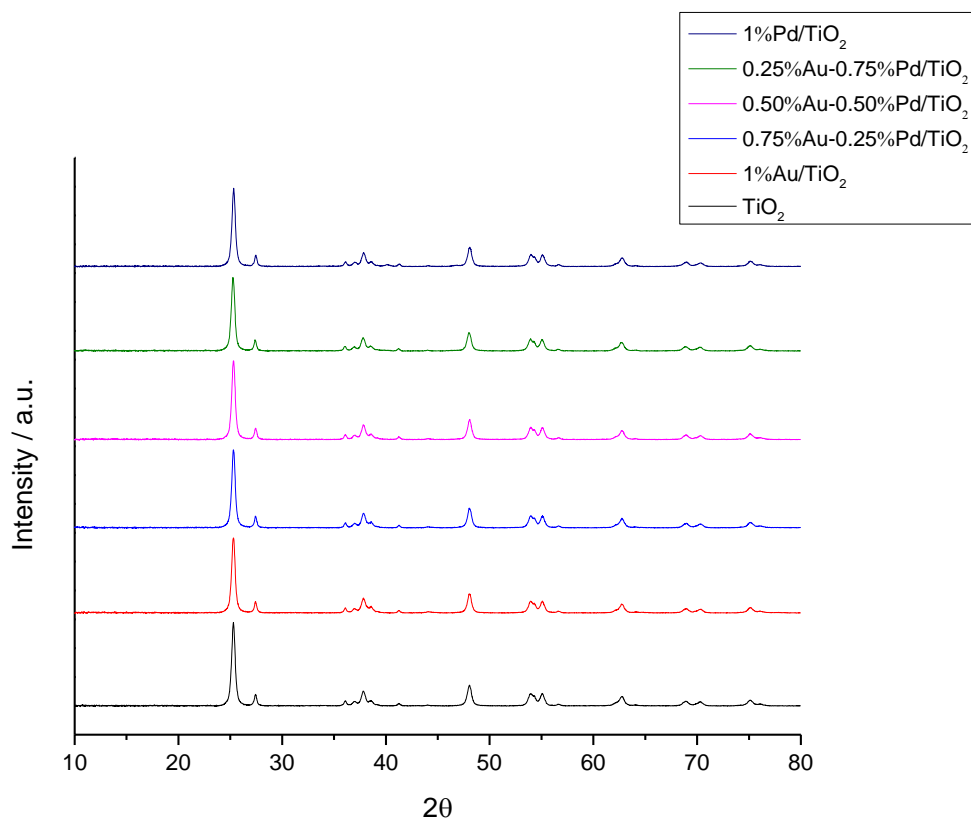
* Hutch@cardiff.ac.uk

Supporting Information

Table S.1. Nominal and actual total metal loading of 1% AuPd/TiO₂ as determined by MP-AES.

Catalyst	Actual Au loading / %	Actual Pd loading / %
1%Au / TiO ₂	1.0	-
0.75%Au-0.25%Pd/TiO ₂	0.76	0.24
0.5%Au-0.5%Pd/TiO ₂	0.53	0.47
0.25%Au-0.75%Pd/TiO ₂	0.27	0.74
1%Pd / TiO ₂	-	0.95

All catalysts exposed to a reductive heat treatment (4 h, 400 °C, 10 °Cmin⁻¹, 5%H₂/Ar).

**Figure S.1.** X-ray diffractograms of 1%Au-Pd/TiO₂ with varying Au:Pd ratio, prepared by modified impregnation, reduced at 400 °C, 4 h, 5%H₂/Ar, ramp rate = 10 °Cmin⁻¹.

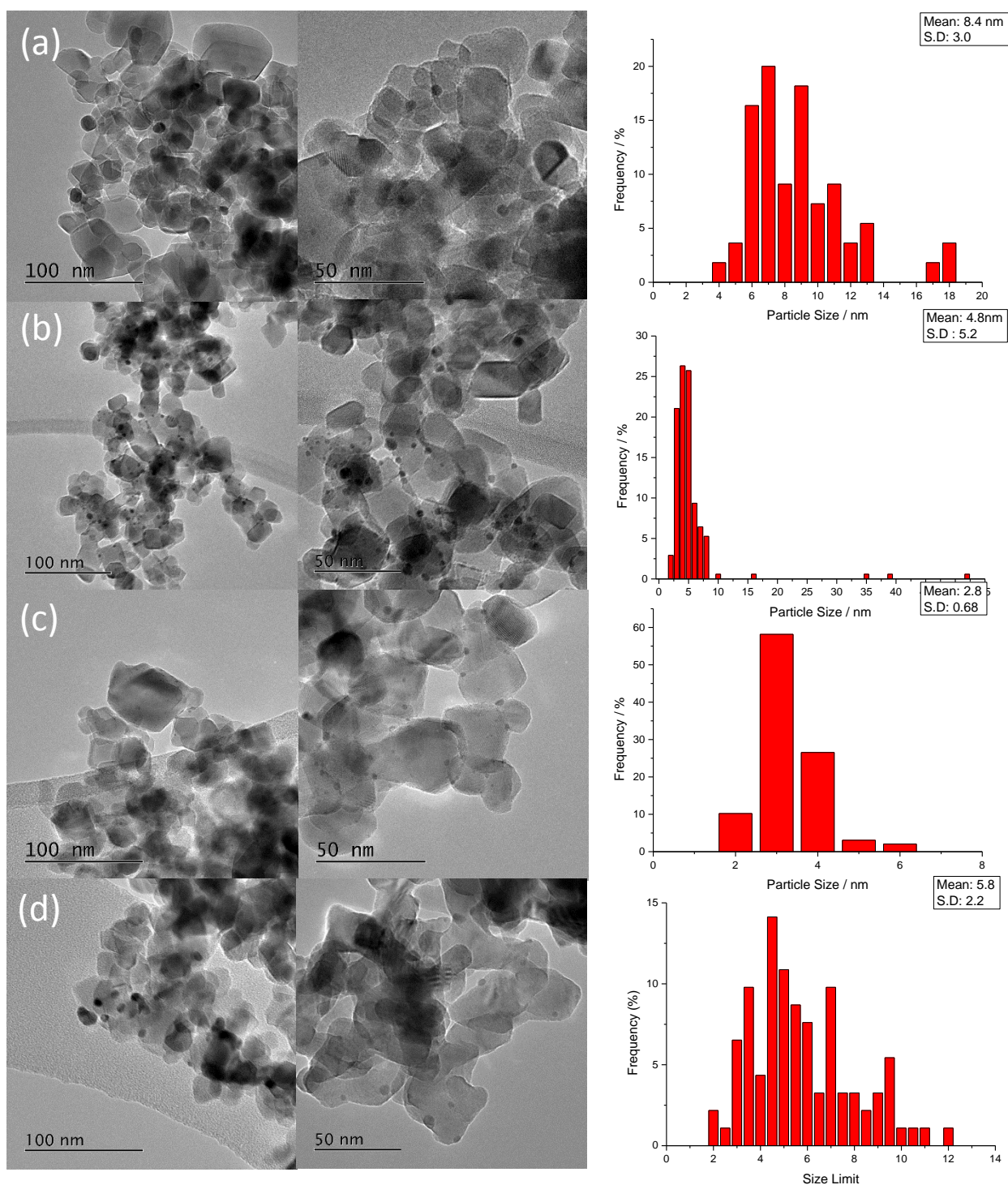


Figure S.2. Transmission electron microscopy of 1%Au-Pd/TiO₂ with varying Au:Pd ratio, prepared by modified impregnation, reduced at 400 °C, 4 h, 5% H₂/Ar, ramp rate = 10 °C min⁻¹. (a) 1%Au/TiO₂, (b) 0.75%Au-0.25%Pd/TiO₂, (c) 0.5%Au-0.5%Pd/TiO₂, (d) 0.25%Au-0.75%Pd/TiO₂. Note that mean particle size for 1%Pd/TiO₂ is unable to be determined due to Pd particle size below detection limit of TEM.

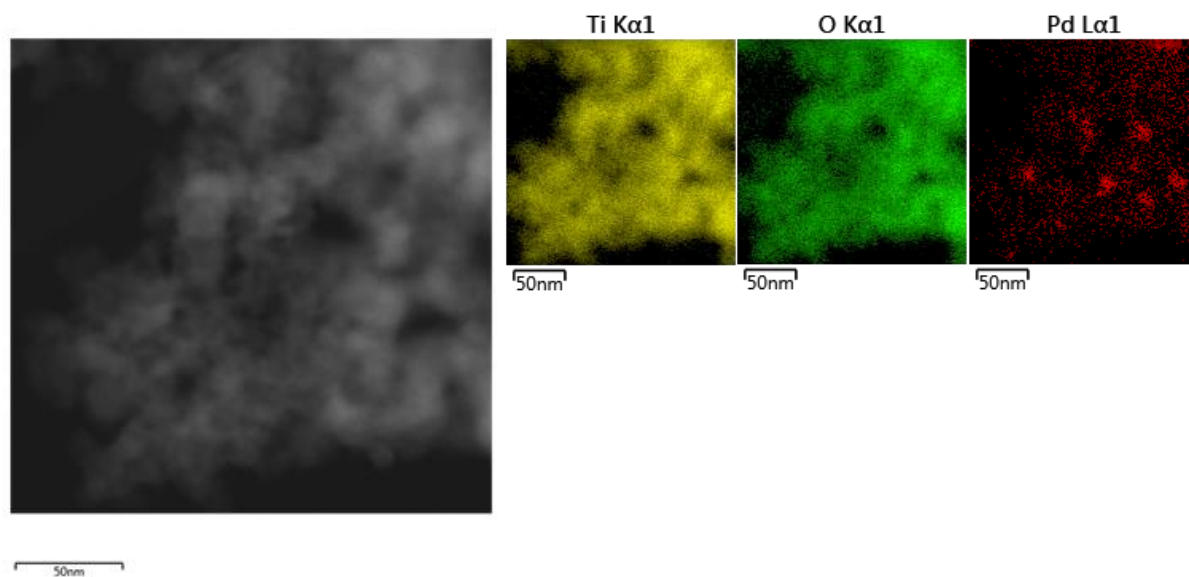


Figure S.3. Energy dispersive X-ray analysis of 1% Pd/ TiO₂ catalyst prepared by modified impregnation, reduced at 400 °C, 4 h, 5%H₂/Ar, ramp rate = 10 °Cmin⁻¹.

Table S.2. Leaching of Au and Pd from 0.5%Au-0.5%Pd/TiO₂ catalyst after H₂O₂ synthesis reaction as determined by ICP.

Conditions	Au leaching / %	Pd leaching / %
H ₂ O/MeOH, 2 °C, CO ₂ diluent	0	0
H ₂ O, 25 °C, N ₂ diluent	0	0.2

Catalyst exposed to a reductive heat treatment (4 h, 400 °C, 10 °Cmin⁻¹, 5%H₂/Ar).