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Supporting Information

Glycerol Selective Oxidation to Lactic Acid over AuPt Nanoparticles; Enhancing Reaction Selectivity and Understanding by Support Modification

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Electronic Supplementary Information (ESI)

Table S1. Total surface areas for a number of TiO_2 support materials. The supports were subsequently used for the synthesis of 1 wt.% AuPt/TiO_2-X catalysts (X = nanocasted (NC), P25, anatase (A) and rutile (R)).

Support Material	Surface Area ($m^2 . g^{-1}$)
TiO_2-NC	110
TiO_2-P25	52
TiO_2-A	97
TiO_2-R	4

Table S2. The influence of reaction temperature on the oxidation of glycerol to lactic acid over 1 wt.% AuPt/TiO_2 (P25). *Reaction conditions*: 3 bar O_2, 2000:1 glycerol:metal ratio, 0.3 M glycerol, 1.2 M NaOH, 10 mL reaction volume, 680 rpm, 4 h.

Temperature (°C)	Conversion (%)	Selectivity (%)				CMB (%)
		LA	GA	TA	Other	
70	100	42	36	20	2	99
80	100	46	30	22	2	98
90	100	52	15	29	4	94
100	100	60	5	29	6	92
110	100	64	4	26	6	90
120	100	63	4	24	9	88

Key: Lactic acid (LA); Glyceric Acid (GA); Tartronic Acid (TA); Other (products arising from C-C cleavage: glycolic acid, oxalic acid, formic acid); carbon mass balance (CMB)

Table S3. Weight loadings for the AuPt catalysts prepared by sol-immobilisation. Known quantities of the catalysts were digested in aqua regia and the Au and Pt amounts were quantified by MP-AES. Wavelengths of 267.505 and 306.471 nm were used to monitor Au and Pt respectively.

Catalyst	Au (wt.%)	Pt (wt.%)	Total Metal Loading (wt. %)	Weight Ratio Au/Pt
AuPt/NC	0.50	0.55	1.05	0.92
AuPt/NC-W	0.50	0.53	1.02	0.94
AuPt/P25	0.48	0.49	0.97	0.98
AuPt/P25-W	0.47	0.50	0.97	0.94

Table S4. Elemental composition and atomic ratios of the AuPt catalysts prepared by sol-immobilisation, as quantified from the XPS spectra displayed in **Figure 5.**

Catalyst	Atomic %					Atomic Ratios	
	Au	Pt	Ti	O	S	Au/Pt	Ti/S

AuPt/TiO_2 NC	1.21	1.44	24.23	69.5	3.63	0.84	6.67
Au/TiO_2 P25	0.28	0.24	27.59	71.42	0.46	1.17	59.98
AuPt/TiO_2 NC W	1.79	2.19	28.05	67.46	0.51	0.82	55.00
AuPt/TiO_2 P25 W	0.28	0.25	28.13	70.90	0.44	1.12	63.93

Table S5. Quantification of the Bronsted and Lewis acidity in the TiO_2-P25, TiO_2-NC and TiO_2-NC-W using pyridine DRIFTS experiments at different temperatures (50 °C – 300 °C).

T=50ºC	**TiO_2-P25**	**TiO_2-NC**	**TiO_2-NC-W**
C_L (µmol/g)	430	137	205
C_B (µmol/g)	0	13	0
C_L+C_B (µmol/g)	430	151	205
T=100ºC			
C_L (µmol/g)	379	77	202
C_B (µmol/g)	0	12	0
C_L+C_B (µmol/g)	379	89	172
T=200ºC			
C_L (µmol/g)	277	60	172
C_B (µmol/g)	0	10	0
C_L+C_B (µmol/g)	277	70	172
T=300ºC			
C_L (µmol/g)	210	34	121
C_B (µmol/g)	0	7	0
C_L+C_B (µmol/g)	-	41	121
T=400ºC			
C_L (µmol/g)	67	48	88
C_B (µmol/g)	0	6	0
C_L+C_B (µmol/g)	67	54	88

* **Note:** Bronsted acidity (C_B), Lewis acidity (C_L), Temperature (T)

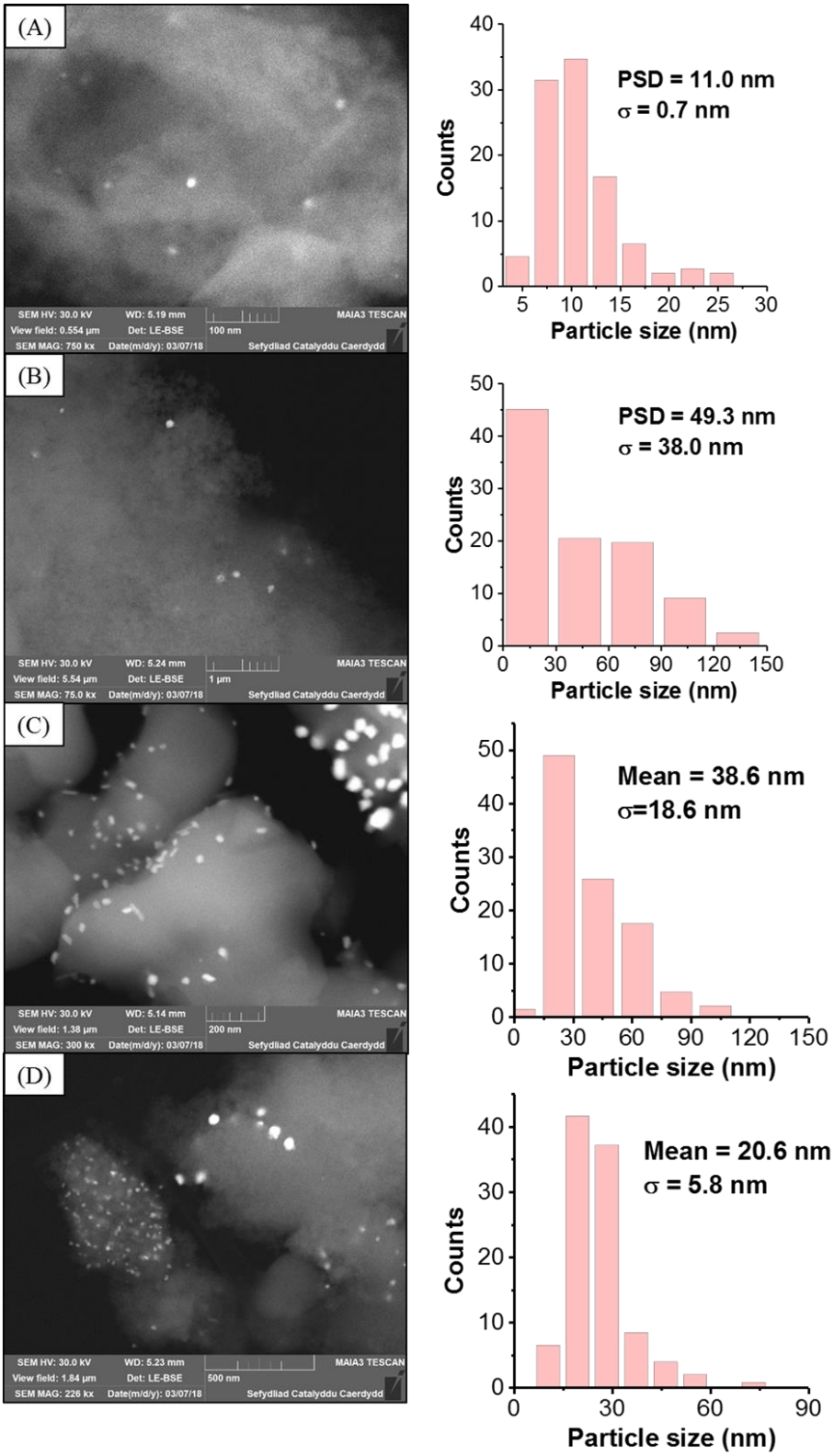

Figure S1: SEM Images and corresponding PSD's for a series of 1 wt.% AuPt catalysts supported on (A) TiO_2-NC, (B) TiO_2-P25, (C) TiO_2-A and (D) TiO_2-R prepared by conventional impregnation.

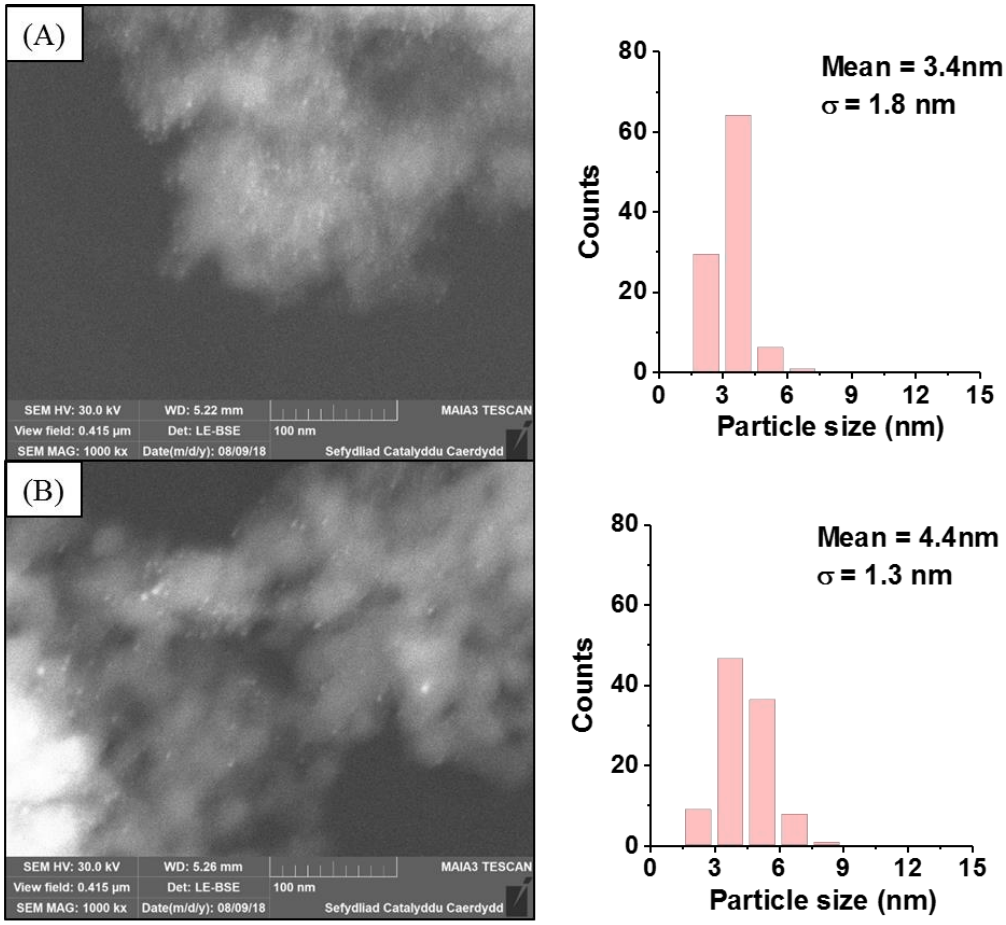

Figure S2: SEM Images and corresponding PSD's for (A) 1 wt.% AuPt/TiO_2-NC and (B) 1 wt.% AuPt/TiO_2-P25 catalysts prepared by sol immobilisation.

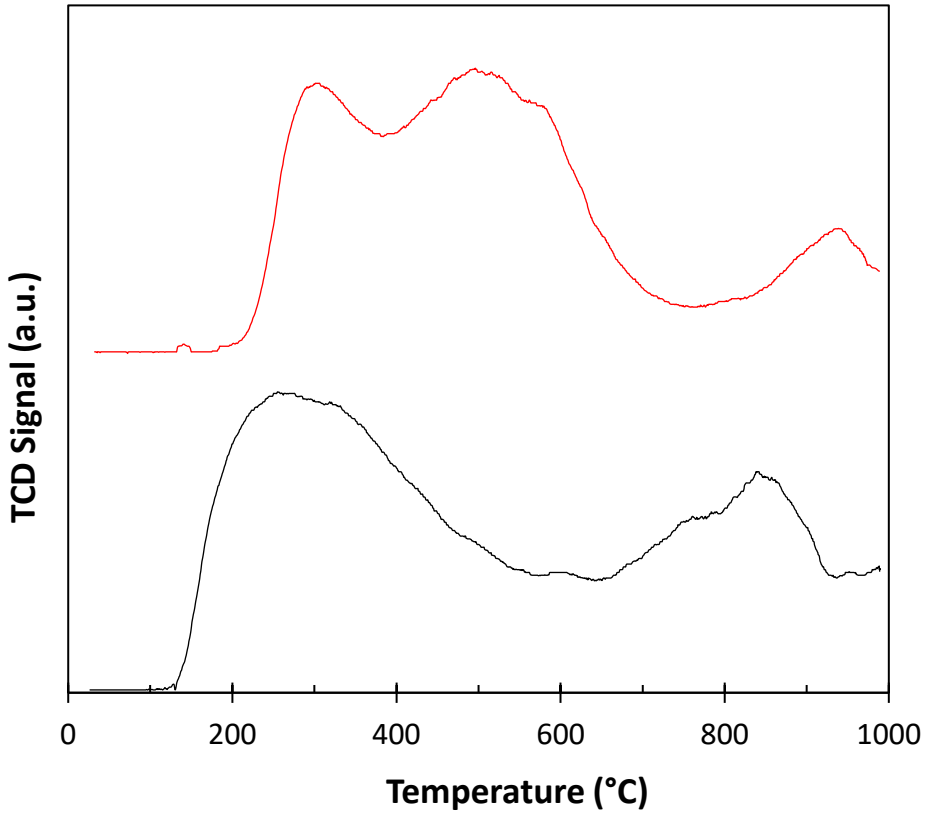

Figure S3: NH_3 temperature programmed desorption experiments conducted on TiO_2-P25 (black line) and TiO_2-NC (red line).