Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A

Embedding catalytic nanoparticles inside mesoporous structures with controlled porosity: Au@TiO_2

Electronic Supplementary Information

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Table SI1. Textural properties of inorganic-organic hybrid materials (before calcination).

As-prepared	Surface area (m^2/g)			Pore volume (cm^3/g)	
	S_{BET}	*Microporous*	*Mesoporous*	V_{tot}	*VBJH*
TiO_2	552	496	56	0.34	
TiO_2 (t)	226	103	123	0.86	0.82
TiO_2 (n)	176	75	101	0.61	0.59
TiO_2 (b)	341	140	201	1.21	1.22
Au@TiO_2	349	10	254	0.32	0.27
Au@TiO_2 (t)	293	87	206	1.86	1.83
Au@TiO_2 (n)	183	36	147	0.76	0.75
Au@TiO_2 (b)	341	75	239	1.32	1.21

Table SI2. Textural properties of the calcined material.

Calcined	Surface area (m^2/g)			Pore volume (cm^3/g)	
	S_{BET}	*Microporous*	*Mesoporous*	V_{tot}	*VBJH*
TiO_2	64	64	-	0.11	
TiO_2 (t)	85	42	43	0.37	0.39
TiO_2 (n)	153	47	106	0.59	0.56
TiO_2 (b)	180	54	126	0.84	0.82
Au@TiO_2	89	8	81	0.16	0.16
Au@TiO_2 (t)	109	12	97	0.57	0.59
Au@TiO_2 (n)	178	44	134	0.74	0.72
Au@TiO_2 (b)	145	53	91	0.82	0.80

Table SI3 . ICP Au content (% wt) of the calcined materials.

Sample name	[Au]
$Au@TiO_2$	0.50
$Au@TiO_2(t)$	1.08
$Au@TiO_2(n)$	0.91
$Au@TiO_2(b)$	0.95
$Au/TiO_2(b)$	1.48

X-ray photoelectron spectroscopy analysis

X-ray photoelectron spectroscopy (XPS) analysis was used to characterize the surface composition and chemical state of $Au@TiO_2$ materials (Figure SI1). XPS was performed with a PHI 5500 Multitechnique System, using a monochromatic Al Kα X-ray source (1486.6 eV, 350 W) which was placed perpendicular to the analyzer. Acquisition time was 2 min for the C 1s, Ti 2p and O1s regions and 60 min for Au 4f. The binding energy scale was corrected for surface charging by taking the C 1s peak of contaminant carbon as a reference at 284.8 eV

From the XPS analysis the Au/Ti ratio was calculated to be on the order of $1x10^{-4}$, pointing out the embedment of gold within the TiO_2 matrix

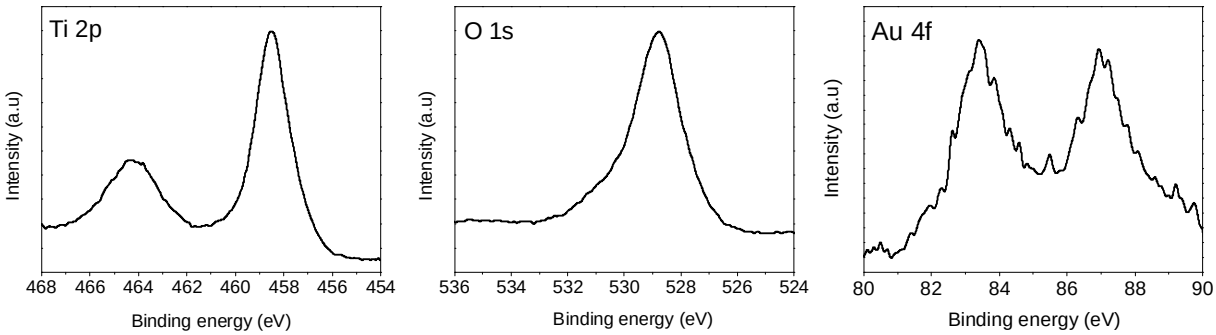

Figure SI1. XPS spectrum of $Au@TiO_2(b)$

Thermogravimetry analysis

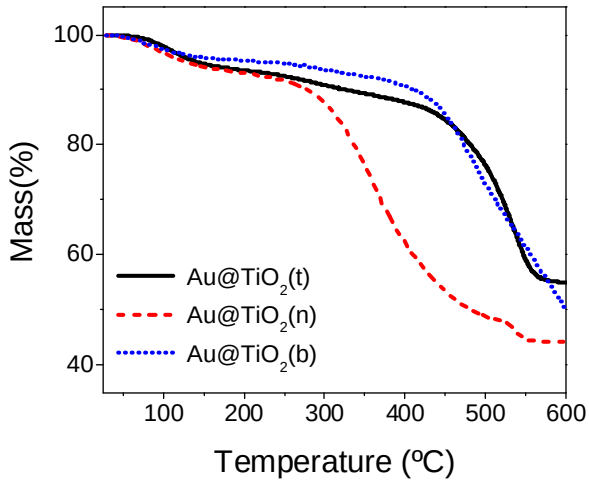

Figure SI2. Thermogravimetric profile of the Au@TiO_2 mesoporous materials.

Scanning electron microscopy (SEM)

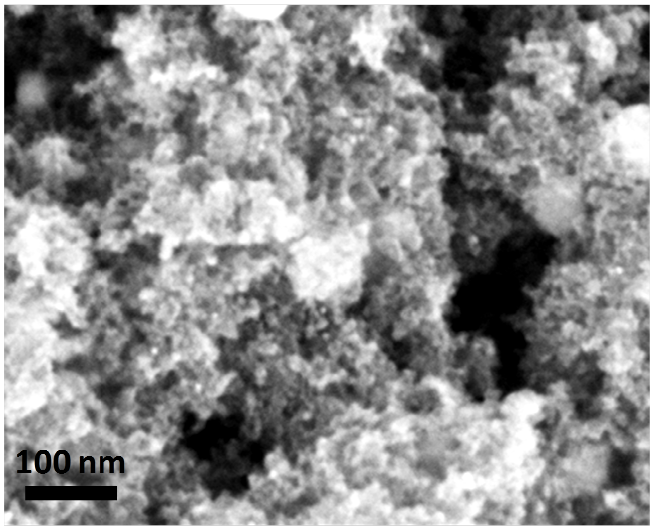

Figure SI3. SEM micrograph of the Au@TiO_2 (b) mesoporous materials.

Selected Area Electron Diffraction pattern

The gold crystallographic planes (002) and (222) were detected by electron diffraction inside the TEM.

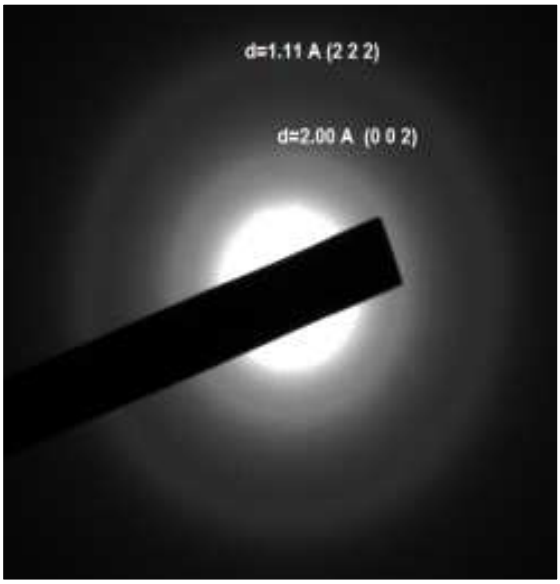

Figure SI4. SAED pattern of the calcined Au@TiO_2 (n) material.