Electronic Supplementary Material (ESI) for RSC Advances

Supporting Information

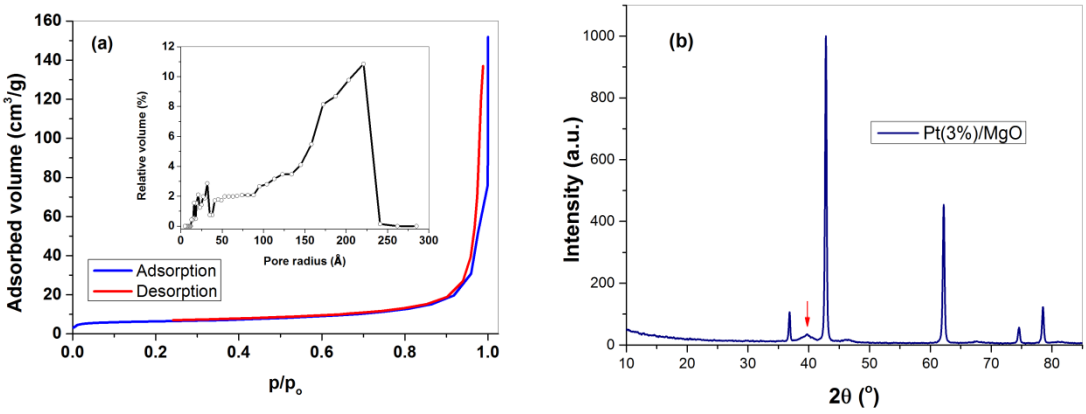

Fig. 1. Nitrogen adsorbtion–desorbtion isotherms for Pt(1%)/MgO; Inset represents the pores' size distribution with a maximum at 22 nm (a); XDR diffraction pattern of Pt(3%)/MgO (b); the arrow indicates the Pt diffraction peak while the rest of the diffraction peaks are due to crystalline MgO.

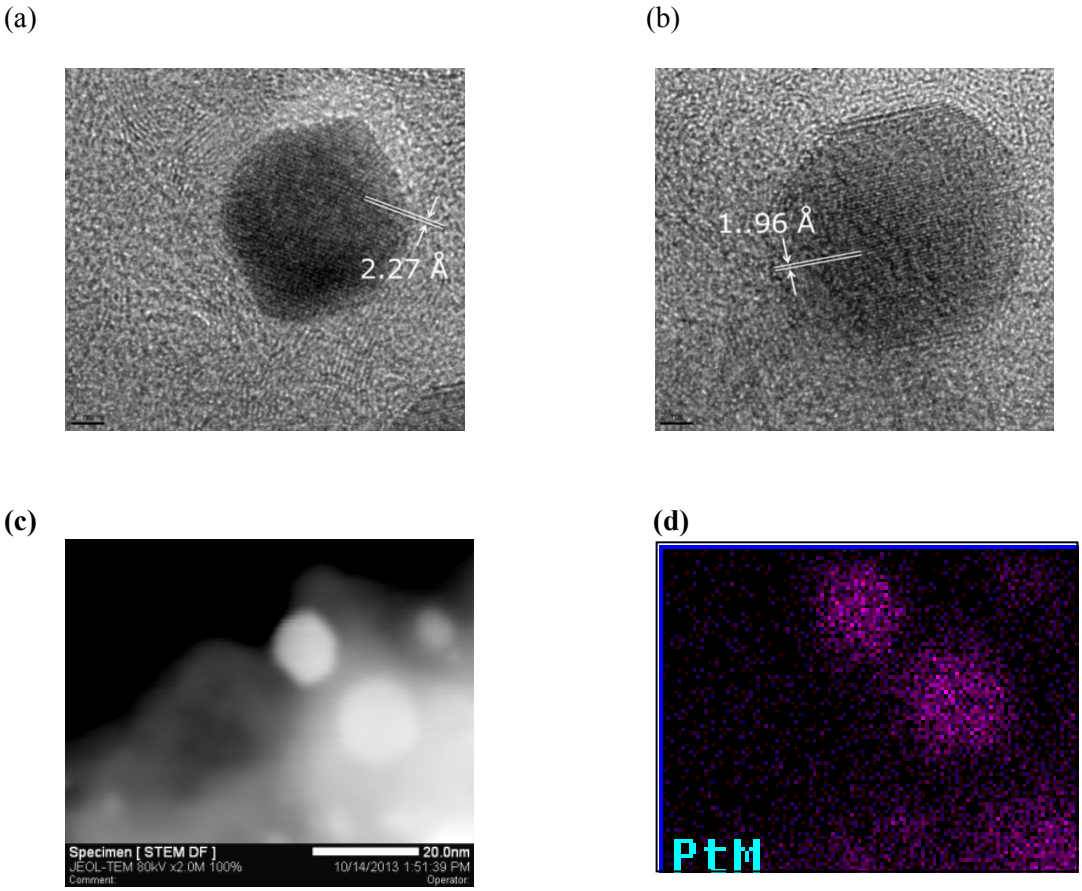

Fig. 2. High resolution TEM microscopy of the Pt nanoparticles in the graphene sample (Pt (3%)-1000-100). The atomic interplanar distances correspond to Pt (111) (a) and Pt (002) (b). STEM analysis of the same sample, indicating that the metallic nanoparticles are composed of Pt.

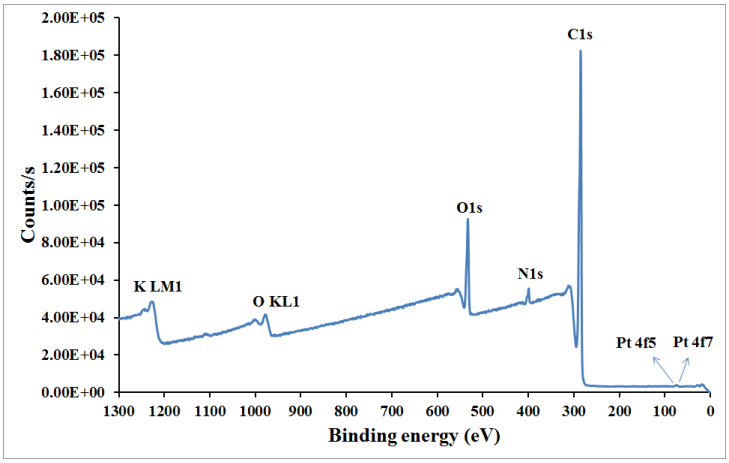

Fig. 3. X-Ray Photoelectron spectroscopy (XPS) wide scan analysis of the Pt(2%)-1000-100-30 sample.

Table 1. Main characteristics (I_G/I_D, I_G/I_{2D}, FWHM si L_a) of the graphenes Pt(x%)-1000-100-30 (x = 1, 2, and 3 %) obtained from the Raman analysis collected with a 514 nm laser excitation. The values presented here represent the averages of measurements collected at 6 different points over the surface of the samples.

Sample	I_G/I_D	I_G/I_{2D}	FWHM (2D) (cm^{-1})	L_a (nm)
Pt(1%)-1000-100-30	0.73; 0 .77; 0.74; 0.72; 0.72; 0.75; 0.74 **0.74 ± 0.01**	2.08; 1.84; 2.1; 2.31; 1.93; 1.77; 1.79; **1.97± 0.16**	101.5; 106.2; 103.3; 103.7; 102.9; 104.7; 105; **103.9 ± 1.2**	12.28
Pt(2%)-1000-100-30	0.8; 0.83; 0.83; 0.8; 0.81; 0.82; **0.82 ± 0.11**	1.92; 1.93; 1.87; 1.87; 1.72; 1.87; **1.86 ± 0.05**	105.8; 102.6; 105.7; 107.2; 103.2; 106.4; **105.1 ± 1.52**	13.28
Pt(3%)-1000-100-30	0.77; 0.84; 0.78; 0.77; 0.75; 0.79; 0.83; **0.79 ± 0.03**	2.2; 2.07; 2.25; 2.06; 2.17; 2.31; 1.99; **2.15 ± 0.09**	111.6; 114.2; 113.3; 107.4; 107.4; 111.5; 113; **111.2 ± 2.2**	13.11

Table 2. Main characteristics (I_G/I_D, I_G/I_{2D}, FWHM si L_a) of the Pt(2%)-t-100-30 (t = 800, 900 and 1000 ^oC) graphenes, obtained from the Raman analysis performed with a 514 nm laser excitation. The values presented here represent the averages of measurements collected at 6 different points on the surface of the samples.

Sample	I_G/I_D	I_G/I_{2D}	FWHM (2D) (cm^{-1})	L_a (nm)
Pt(2%)-800-100-30	0.97; 0.95; 0.96; 0.96; 0.82; 0.83; **0.92 ± 0.13**	3.12; 1.68; 1.68; 1.74; 1.65; 1.66; **1.92 ± 0.68**	124; 105.8; 103.9; 106.4; 106.2; 106.9; **113.9 ± 8.4**	15.19
Pt(2%)-900-100-30	0.83; 0.83; 0.84; 0.83; 0.8; 0.8; **0.82 ± 0.02**	1.69; 1.81; 2.03; 2.2; 2.16; 2.53; **2.07 ± 0.23**	103.0; 111.9; 97.3; 109.5; 108.3; 114.8; **107.5 ± 4.9**	13.61
Pt(2%)-1000-100-30	0.8; 0.83; 0.83; 0.8; 0.81; 0.82; **0.81 ± 0.11**	1.92; 1.93; 1.87; 1.87; 1.72; 1.87; **1.86 ± 0.05**	105.8; 102.6; 105.7; 107.2; 103.2; 106.4; **105.1 ± 1.52**	13.23

Table 3. Main characteristics obtained by the interpretation of the TGA/DTA curves for the Pt(2%)-1000-f-30 (where f = 50, 75, 100 and 125 mL/min) samples.

Sample	η_s[a] (%)	Purity (%)	Thermal decomposition temperature (^oC)
Pt(2%)-1000-50-30	28	92	528.8
Pt(2%)-1000-75-30	29	94.5	544.1
Pt(2%)-1000-100-30	31	94	544.7
Pt(2%)-1000-125-30	35	96	551.5

[a] η_s synthesis yield values were calculated based on the amount that burned off as a percentage of the entire sample mass of the catalyst.

Table 4. Main characteristics (I_G/I_D, I_G/I_{2D}, FWHM and L_a) of the Pt(2%)-1000-f-30 (where f = 50, 75, 100, and 125 mL/min) graphenes obtained from the Raman analysis performed with a 514 nm laser excitation. The values presented here represent the averages of measurements collected at 6 different points on the surface of the samples.

Sample	I_G/I_D	I_G/I_{2D}	FWHM (2D) (cm^{-1})	L_a (nm)
Pt(2%)-1000-50-30	0.76; 0.84; 0.74; 0.78; 0.76; 0.76; **0.77 ± 0.02**	1.9; 1.8; 1.8; 2.0; 1.7; 1.75; **1.83 ± 0.08**	100.1; 101.8; 97.2; 103.7; 99.3; 102.5; **100.8 ± 1.4**	12.78
Pt(2%)-1000-75-30	0.83; 0.80; 0.79; 0.84; 0.76; 0.76; **0.8 ± 0.03**	1.96; 1.98; 2.09; 2.04; 2.1; 2.01; **2.03 ± 0.05**	109.4; 104.7; 106.8; 105.8; 106.3; 108.9; **107 ± 1.7**	13.28
Pt(2%)-1000-100-30	0.8; 0.83; 0.83; 0.8; 0.81; 0.82; **0.82 ± 0.11**	1.92; 1.93; 1.87; 1.87; 1.72; 1.87; **1.86 ± 0.05**	105.8; 102.6; 105.7; 107.2; 103.2; 106.4; **105.1 ± 1.52**	13.28
Pt(2%)-1000-125-30	0.87; 0.83; 0.84; 0.83; 0.82; 0.84; **0.84 ± 0.01**	1.96; 2.04; 2.01; 2.02; 2.11; 2.11; **2.04 ± 0.04**	108.5; 110.1; 107.3; 105.6; 109.8; 116.3; **109.6 ± 2.5**	13.94

Table 5. Main characteristics obtained from TGA/DTA analsyis for the Pt(2%)-1000-100-t (where t = 15, 30, and 45 min) samples.

Sample	η_s[a] (%)	Purity (%)	Thermal decomposition temperature (^oC)
Pt(2%)-1000-100-15	11.9	91.3	565.3
Pt(2%)-1000-100-30	29.4	93.9	544.7
Pt(2%)-1000-100-45	30.7	93.3	540.8

[a] η_s synthesis yield values were calculated based on the amount that burned off as a percentage of the entire sample mass of the catalyst.

Table 6. Main parameters (I_G/I_D, I_G/I_{2D}, FWHM and L_a) of the Pt(2%)-1000-100-t (t = 5, 15, 30, and 45 min) graphenes obtained from the analysis of the Raman spectra collected with a laser excitation of 514 nm. The values presented here represent the averages of measurements collected at 6 different points on the surface of the samples.

Sample	I_G/I_D	I_G/I_{2D}	FWHM (2D) (cm^{-1})	L_a (nm)
Pt(2%)-1000-100-5	0.69; 0.73; 0.72; 0.72; 0.72; 0.72; **0.72 ± 0.01**	1.71; 1.58; 1.62; 1.74; 1.61; 1.61; **1.64 ± 0.52**	88.7; 91.6; 88.5; 94.0; 90.8; 92.5; **91 ± 1.68**	11.95
Pt(2%)-1000-100-15	0.71; 0.68; 0.74; 0.69; 0.8; 0.70; **0.72 ± 0.33**	1.72; 1.77; 1.73; 1.89; 1.73; 1.72; **1.76 ± 0.47**	90.3; 90.8; 96.6; 91.0; 90.7; 90.3; **91.6± 1.65**	11.96
Pt(2%)-1000-100-30	0.8; 0.83; 0.83; 0.8; 0.81; 0.82; **0.82 ± 0.11**	1.92; 1.93; 1.87; 1.87; 1.72; 1.87; **1.86 ± 0.05**	105.8; 102.6; 105.7; 107.2; 103.2; 106.4; **105.1 ± 1.52**	13.23
Pt(2%)-1000-100-45	0.79; 0.77; 0.8; 0.83; 0.84; 0.86; **0.81 ± 0.03**	1.63; 1.66; 1.7; 1.61; 1.64; 1.42; **1.61 ± 0.35**	96.9; 103.9; 99.7; 98; 97.3; 101; **99.5± 2.07**	13.45