Electronic Supplementary Material (ESI) for Catalysis Science & Technology.

Improved synthesis and hydrothermal stability of Pt/C catalysts based on size-controlled nanoparticles

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Supporting information

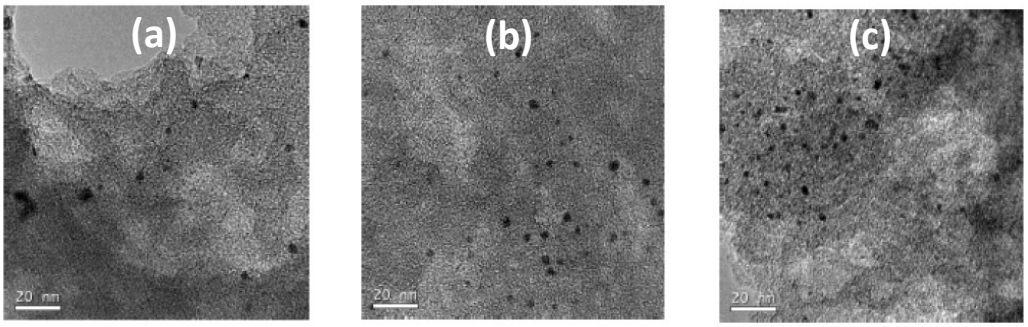

Fig. S1. TEM images of catalysts prepared by a) *ex situ* b) *in situ 1* and c) *in situ 2* methods at PVP/Pt = 100 and $NaBH_4$/Pt = 10; (samples 2, 4 and 6, respectively). Bar length: 20 nm.

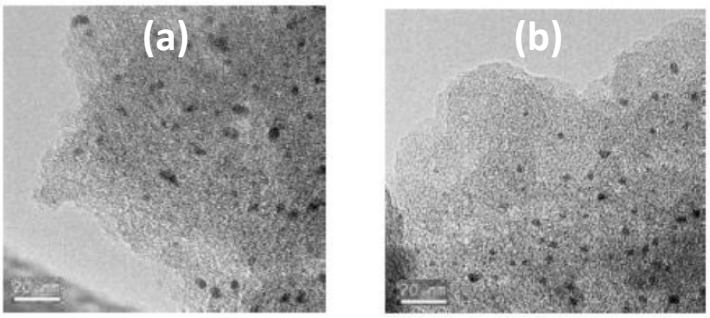

Fig. S2. TEM images of catalysts prepared by a) *in situ 1* and b) *in situ 2* methods at PVP/Pt = 10 and $NaBH_4$/Pt = 26; (samples 7 and 8, respectively). Bar length: 20 nm.

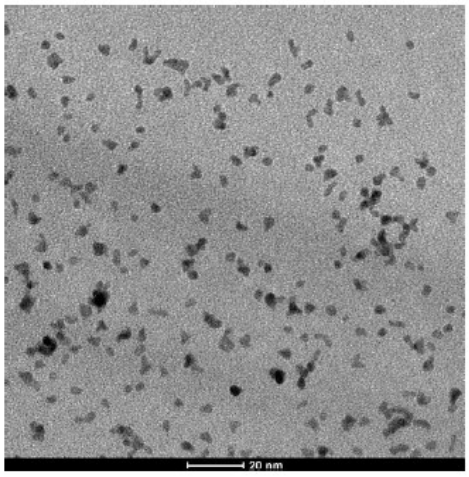

Figure S3. Representative TEM image of sample Pt-$NaBH_4$10-PVP10.

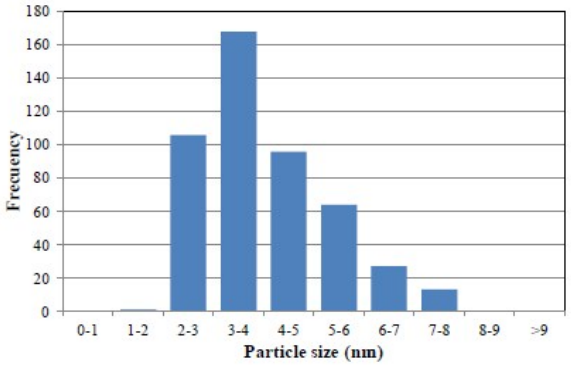

Figure S4. Nanoparticle size distribution for sample Pt-$NaBH_4$10-PVP10.

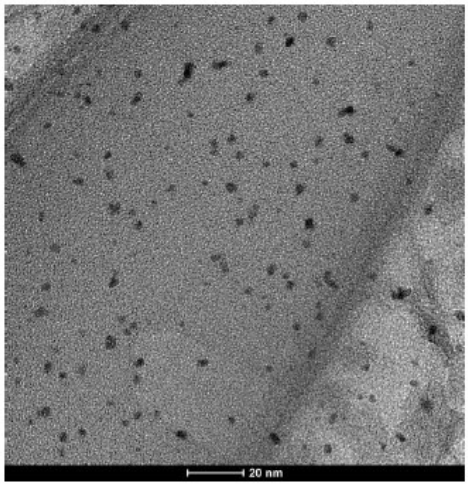

Figure S5. Representative TEM image of sample Pt-$NaBH_4$10-PVP100.

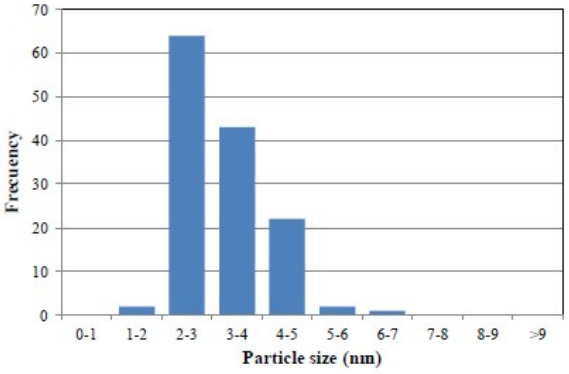

Figure S6. Nanoparticle size distribution for sample Pt-$NaBH_4$10-PVP100.

Table S1. Pt NPs synthesis conditions, number average diameter, surface average diameters and standard deviation.

Sample	Reducing agent	$NaBH_4$/metal (mol/mol)	PVP/Metal (mol/mol)	d_s (nm)	d_n (nm)	σ (nm)
Pt-$NaBH_4$10-PVP10	$NaBH_4$	10	10	4.82	4.00±0.12*	1.18* < 1.26 < 1.34*
Pt-$NaBH_4$10-PVP100	$NaBH_4$	10	100	3.63	3.17±0.14*	0.75* < 0.84 < 0.95*

d_n = number average diameter = $\frac{\sum n_i \cdot d_i}{\sum n_i}$; d_s = surface average diameter = $\frac{\sum n_i \cdot d_i^3}{\sum n_i \cdot d_i^2}$; σ = standard deviation

* 95% confidence intervals calculated using MATLAB software

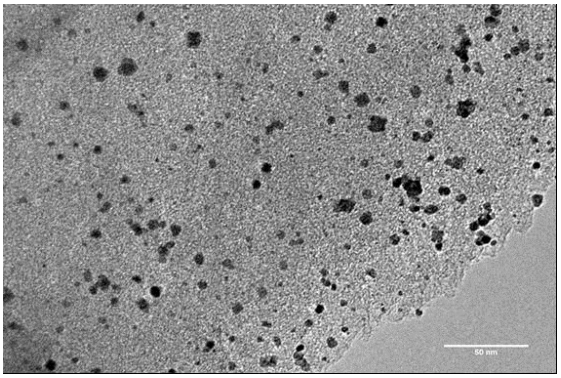

Figure S7. Representative TEM image of a sample synthesized by chemical reduction with $NaBH_4$ without PVP.

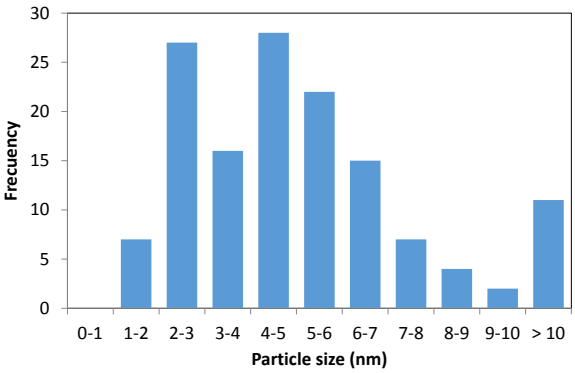

Figure S8. Nanoparticle size distribution for a sample synthesized by chemical reduction with $NaBH_4$ without PVP.

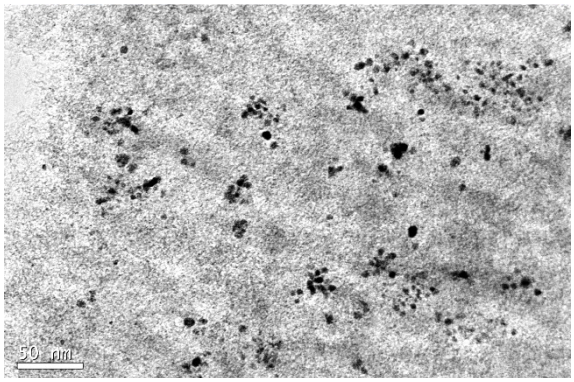

Figure S9. Representative TEM image of a sample synthesized by incipient wetness impregnation.

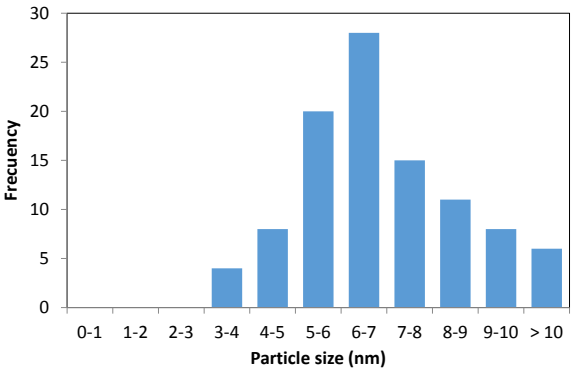

Figure S10. Nanoparticle size distribution for a sample synthesized by incipient wetness impregnation.

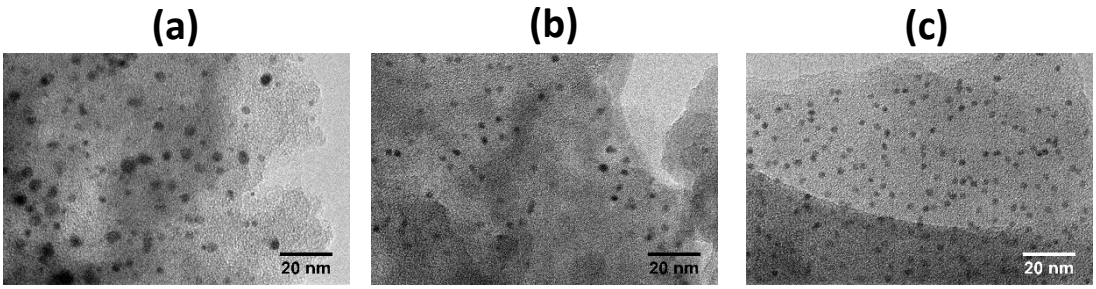

Fig S11. Representative TEM images of the samples synthesized by in situ routes and subjected to pyrolysis at 500 ^{o}C (a) 3: *in situ 1*, PVP/Pt = 10; (b) 4: *in situ 1*, PVP/Pt = 100; and (c) 6 *in situ 2*, PVP/Pt = 100.