Electronic Supplementary Material (ESI) for Green Chemistry.

Supporting Information

Leach-resistant Pt nanoparticles on a silica support serving as a clean, efficient, and recyclable catalyst for solvent-free hydrosilylation

Srinivas Komati,[a] Kenrick M. Lewis,[b] Debarshi Dasgupta,[a] Kalyanachakravarthi Kothapalli,[a] Abirami Srikanth,[a] Alok Sarkar*[a]

[a]*Corporate R&D Center, Momentive Performance Materials Inc., Survey No. 09, Hosur Road, Electronic City (West), Bangalore 560100, India.*

[b]*Momentive Performance Materials Inc., 769 Old Saw Mill River Road, Tarrytown, NY 10591, USA.*

CONTENTS:

1. **Tables**
2. **Figures**
3. **NMR Data**

Table S1. Details of sample digestion using CEM Microwave.

Stage	Max Power	% Power	Ramp (min)	PSI (control)	°C (control)	Hold (min)
1	400 W	25	5	500	50	3
2	400 W	50	5	500	100	3
3	400 W	75	5	500	150	3
4	400 W	100	5	500	200	30

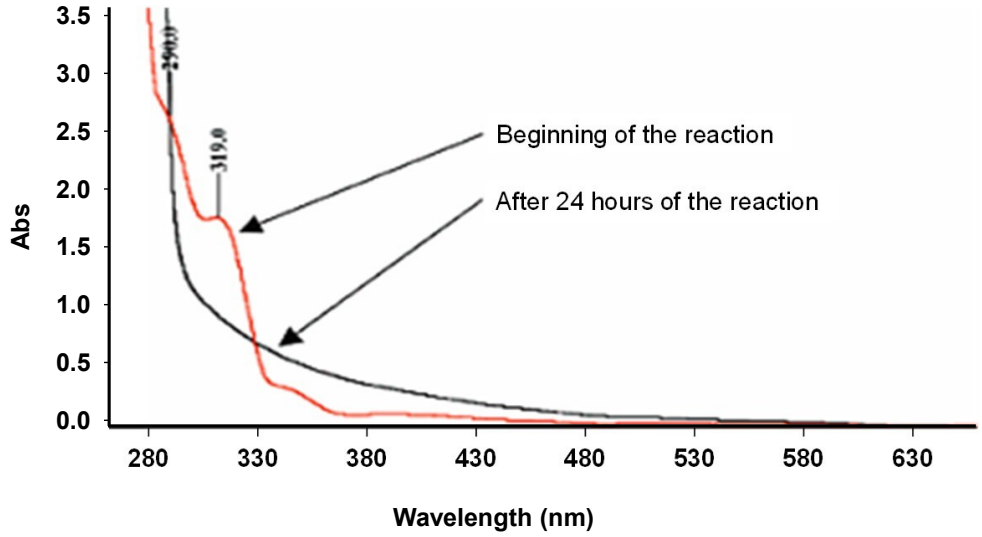

Figure S1: UV-vis spectra of the reaction mixture before and after reduction of $Me_2Pt(COD)$

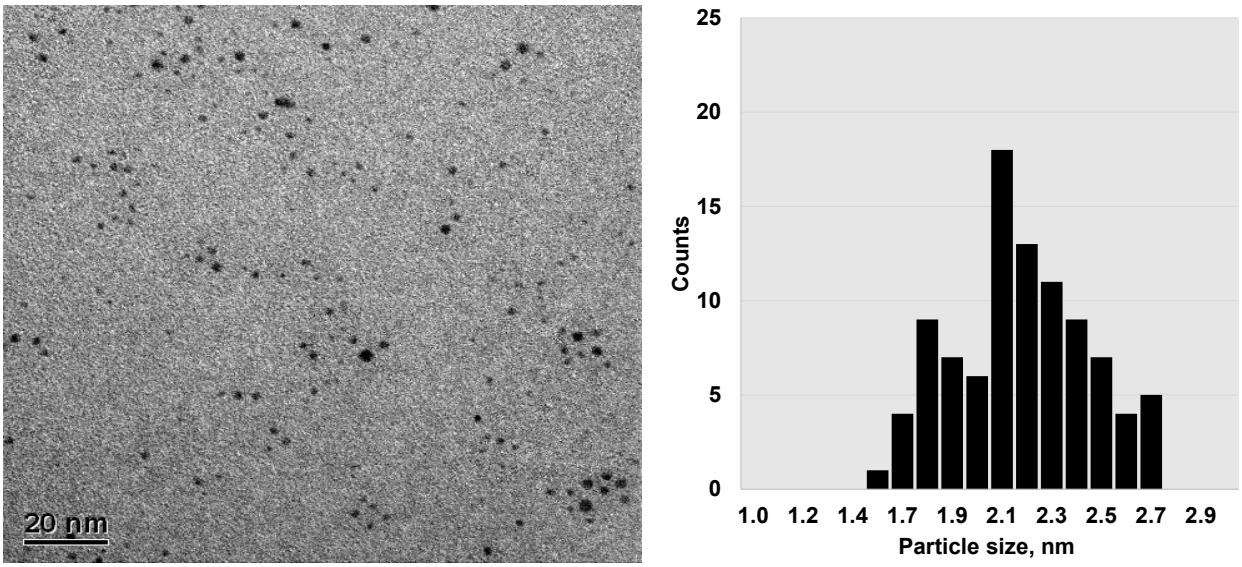

Figure S2: TEM image of the solution after 24 hour after the reduction of $Me_2Pt(COD)$.

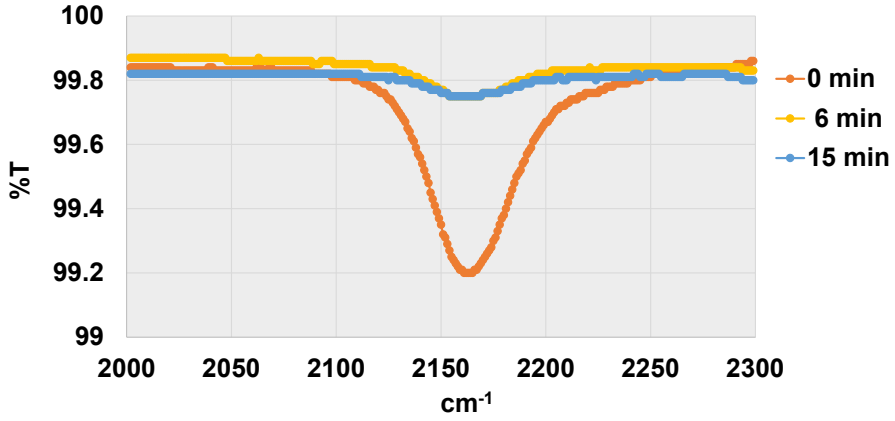

Figure S3: FTIR peak for Si-H of polysiloxane stabilized Pt nanoparticle solution at 0, 6 and 15 min of aerial oxidation.

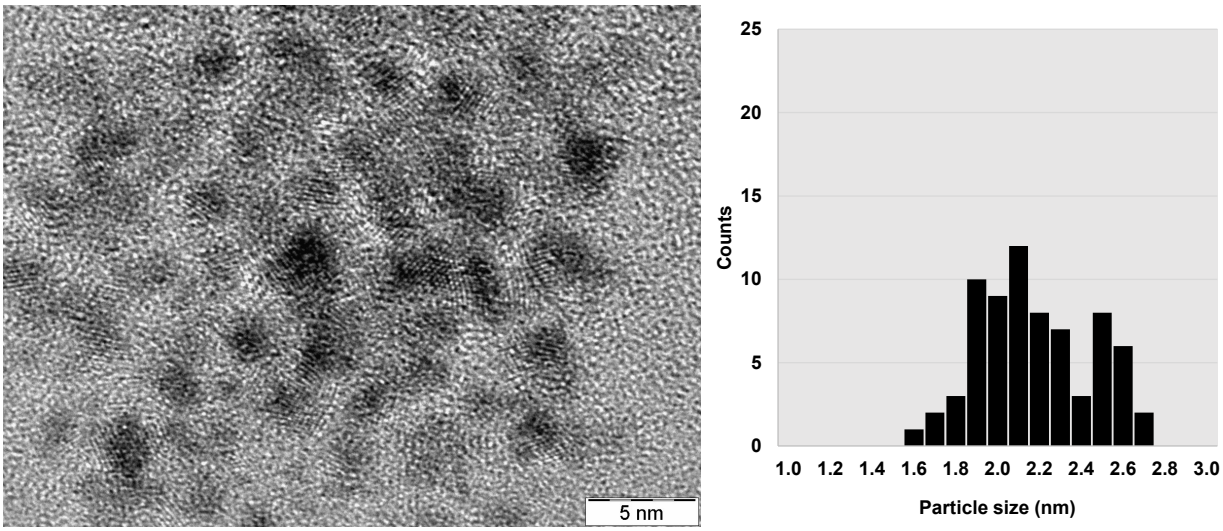

Figure S4: HRTEM image and particle size analysis of Pt@PDMS@vinyl-modified silica.

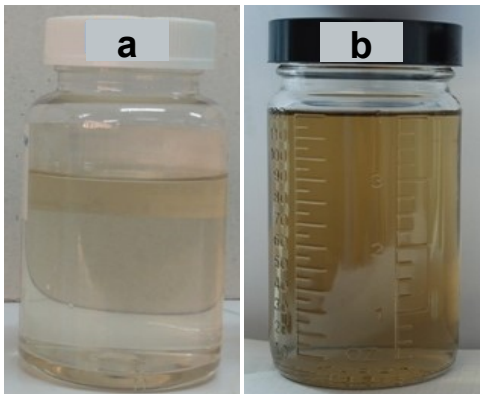

Figure 5S: The appearance of Silicone polyether obtained by (a) Pt@PDMS@vinyl-modified silica (B) CPA catalyst

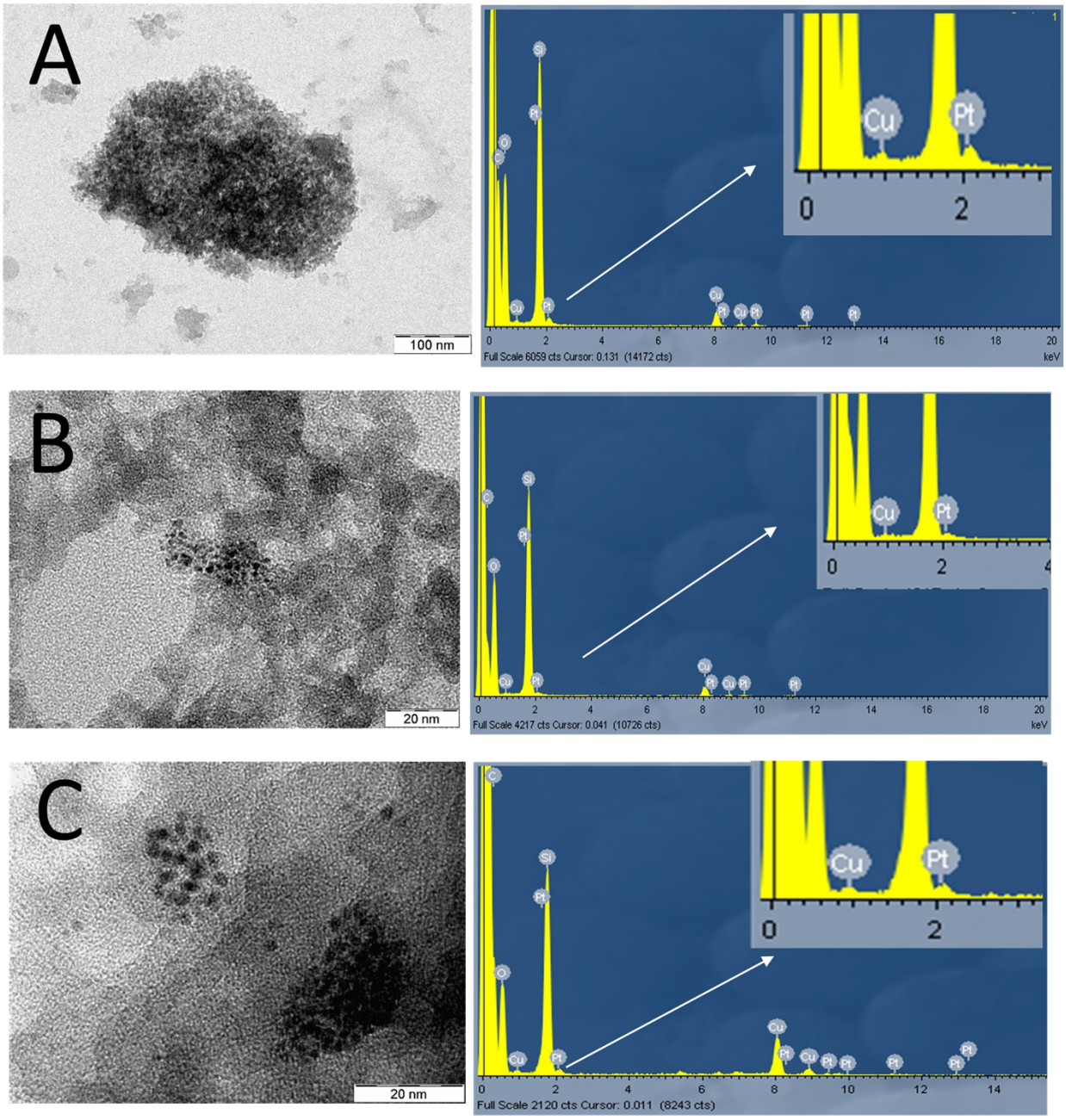

Figure S6: Energy Dispersive Spectroscopy (EDS) data for Pt@PDMS@vinyl-modified silica at different location, A, B and C on the grid. (Signal of Cu comes of the TEM grid)

Comparative Study for catalytic activity of Pt@PDMS@vinyl-modified silica against Pt@{wall}SBA-15.

The hydrosilylation of 1-octene with polymethylhydrosiloxane (PMHS) containing about 40 Si-H units was used for activity comparison of the present Pt nanoparticle catalyst with previously reported catalyst, Pt@{wall}SBA-15.[1] A three-necked flask equipped with a magnetic stirrer, reflux condenser, a thermometer was then loaded with PMHS (2.0 mmol, 4.46g) and the catalyst powder (0.042 g, 6 ppm of Pt). The suspension was preheated at 75 ^{o}C, and 1-octene (9.6 g, 1.2 equivalent of 1-octene vs. SiH) was added dropwise over a period of 30 minutes under a constant stirring at 200 RPM. Afterward, the reaction was monitored by ^{1}H NMR where the 98% Si-H conversion was indicated after 8 hours. Under identical reaction conditions, the earlier reported catalyst, Pt@{wall}SBA-15 is reported to give only 70% conversion in 8 hours. ^{1}H NMR (400MHz, CDCl3) δ 0.05-0.25 (m, 126H), δ 0.55 (m, 72H), δ 0.90 - 1.30 (m, 540H).

NMR Data for hydrosilylation products.

Heptamethyl(octyl)trisiloxane. (Entry 1-3, Table 1)

^{1}H NMR (400MHz, $CDCl_3$) δ -0.10 (s, 3H), 0.0 (s, 18H), 0.48 (m, 2H), 0.80 (t, 3H, *J*=8.8 Hz), 1.20 (m, 12H).

Heptamethyl (3-glycidyloxypropyl))trisiloxane. (Entry 4, Table 1)

^{1}H NMR (400MHz, $CDCl_3$) δ -0.10 (s, 3H), 0.0 (s, 18H), 0.39 (m, 2H), 1.50 (m, 2H), 2.50 (m, 1H), 2.7 (t, 1H), 3.08 (m, 1H), 3.24 (m, 3H), 3.59 (m, 1H).

Polyether functionalized trisiloxane (Entry 5, Table 1)

^{1}H NMR (400MHz, $CDCl_3$) δ 0.05 (m, 21H), 0.39 (m, 2H), 1.56 (m, 2H), 3.30 (s, 3H), 3.6 (m, 30H).

Octyl terminated polydimethylsiloxane. (Entry 1, Table 2)

^{1}H NMR (400MHz, $CDCl_3$) δ 0.01 (s, 120H), 0.48 (m, 4H), 0.80 (m, 6H), 1.23 (m, 24H).

4-ethylcyclohexyl-1, 2-epoxide terminated polydimethylsiloxane. (Entry 2, Table 2)

^{1}H NMR (400MHz, $CDCl_3$) δ 0.01 (s, 588 H), 0.39 (m, 4H), 1.12 (m, 4H), 1.38 (s, 6H), 1.5-2.13 (m, 8H), 3.06 (m, 4H).

Polyether terminated polydimethylsiloxane. (Entry 3, Table 2)

^{1}H NMR (400MHz, $CDCl_3$) δ -0.03 (m, 120H), 0.44 (m, 4H), 1.53 (m, 4H), 3.57 (m, 60H).

^{29}Si NMR (100MHz; $CDCl_3$) 7.5, -22.1.

Eugenol terminated polydimethylsiloxane. (Entry 4, Table 2)

^{1}H NMR (400MHz, $CDCl_3$) δ 0.00 (m, 588H), 0.50 (m, 4H), 1.52 (m, 4H), 2.47 (m, 4H), 3.25 (s, 6H), 6.6-6.8 (m, 6H).

^{29}Si NMR (100MHz; $CDCl_3$) 7.6, -21.8.

3-propyloxy 1,2 propanediol terminated polydimethylsiloxane. (Entry 5, Table 2)

^{1}H NMR (400MHz, $CDCl_3$) δ -0.02 (m, 120H), 0.45 (m, 4H), 1.54 (m, 4H), 3.35-3.96 (m, 14H).

^{29}Si NMR (100MHz; $CDCl_3$) 7.6, -21.9.

Silyl undecanoate terminated polydimethylsiloxane. (Entry 6, Table 2)

^{1}H NMR (400MHz, $CDCl_3$) δ 0.05 (m, 588H), 0.20 (s, 3H), 0.51 (m, 4H), 1.2 (m, 28H), 1.5 (m, 8H), 2.25 (t, 4H).

^{29}Si NMR (100MHz; $CDCl_3$) 22.6, 7.6, -22.0.

References:

1. T. Galeandro-Diamant, R. Sayah, M. -L. Zanota, S. Marrot, L. Veyre, C. Thieuleux, V. Meille. *Chem. Commun.,* 2017, **53**, 2962-2965.