

## Catalyst Research Sets: Brief Overview

Set #	M-NP	NP Composition	NP-Size	Support Material	Support Size*	loading	Parameter Variation
Set 1 – 12	Au-NP; Pt-NP; Pd-NP	monometallic	<b>variable</b>	activated Carbon; $\alpha$ -Al <sub>2</sub> O <sub>3</sub> ; TiO <sub>2</sub> (anatase); ZrO <sub>2</sub>	300 – 630 $\mu$ m	0.1% w/w	3.5 $\pm$ 0.5 nm; 5 $\pm$ 0.5 nm; 7 $\pm$ 1 nm
Set 13 – 24	<b>variable</b>	monometallic	3.5 $\pm$ 0.5 nm; 5 $\pm$ 0.5 nm; 7 $\pm$ 1 nm	activated Carbon; $\alpha$ -Al <sub>2</sub> O <sub>3</sub> ; TiO <sub>2</sub> (anatase); ZrO <sub>2</sub>	300 – 600 $\mu$ m	0.1% w/w	Au-NP; Pd-NP; Pt-NP
Set 25 – 28	Au/Pd-NP (alloys)	<b>variable</b>	3.5 $\pm$ 0.5 nm	activated Carbon; $\alpha$ -Al <sub>2</sub> O <sub>3</sub> ; TiO <sub>2</sub> (anatase); ZrO <sub>2</sub>	300 – 600 $\mu$ m	0.1% w/w	10/90 mol-% Au/Pd 20/80 mol-% 50/50 mol-%
Set 29 – 40	Au-NP; Pt-NP; Pd-NP; Au/Pd-NP (alloys)	Monometallic or bimetallic (10/90, 20/80, 50/50 mol-%)	3.5 $\pm$ 0.5 nm; 5 $\pm$ 0.5 nm; 7 $\pm$ 1 nm	<b>variable</b>	300 – 600 $\mu$ m	0.1% w/w	activated Carbon; $\alpha$ -Al <sub>2</sub> O <sub>3</sub> ; TiO <sub>2</sub> (anatase); ZrO <sub>2</sub>
Set 41 – 80	Au-NP; Pt-NP; Pd-NP; Au/Pd-NP (alloys)	Monometallic or bimetallic (10/90, 20/80, 50/50 mol-%)	3.5 $\pm$ 0.5 nm; 5 $\pm$ 0.5 nm; 7 $\pm$ 1 nm	activated Carbon; $\alpha$ -Al <sub>2</sub> O <sub>3</sub> ; TiO <sub>2</sub> (anatase); ZrO <sub>2</sub>	300 – 600 $\mu$ m	<b>variable</b>	0.05% w/w; 0.10% w/w; 0.15% w/w
on demand	Au-NP; Pt-NP; Pd-NP; Au/Pd-NP (alloys)	Monometallic or bimetallic (10/90, 20/80, 50/50 mol-%)	3.5 $\pm$ 0.5 nm; 5 $\pm$ 0.5 nm; 7 $\pm$ 1 nm	activated Carbon; $\alpha$ -Al <sub>2</sub> O <sub>3</sub> ; TiO <sub>2</sub> (anatase); ZrO <sub>2</sub>	<b>variable</b>	0.05% w/w; 0.10% w/w; 0.15% w/w;	160 – 1250 $\mu$ m; Pellets (on demand)

\*except activated Carbon

## Catalyst Research Sets: Detailed Information

Set #	Noble Metal NP Species	Noble Metal NP Composition	NP-Size	Support Material	Support Size	loading	Parameter Variation
Set 1	Au-NP	monometallic	See Parameter Variation	$\alpha$ -Al <sub>2</sub> O <sub>3</sub>	300 – 630 $\mu$ m	0.1% w/w	<b>Catalysts 1: 3.5 nm; Catalysts 2: 5 nm and Catalyst 3: 7 nm</b>
Set 2	Pt-NP	monometallic	See Parameter Variation	$\alpha$ -Al <sub>2</sub> O <sub>3</sub>	300 – 630 $\mu$ m	0.1% w/w	<b>Catalysts 1: 3.5 nm; Catalysts 2: 5 nm and Catalyst 3: 7 nm</b>
Set 3	Pd-NP	monometallic	See Parameter Variation	$\alpha$ -Al <sub>2</sub> O <sub>3</sub>	300 – 630 $\mu$ m	0.1% w/w	<b>Catalysts 1: 3.5 nm; Catalysts 2: 5 nm and Catalyst 3: 7 nm</b>
Set 4	Au-NP	monometallic	See Parameter Variation	activated Carbon	Norit SX Plus	0.1% w/w	<b>Catalysts 1: 3.5 nm; Catalysts 2: 5 nm and Catalyst 3: 7 nm</b>
Set 5	Pt-NP	monometallic	See Parameter Variation	activated Carbon	Norit SX Plus	0.1% w/w	<b>Catalysts 1: 3.5 nm; Catalysts 2: 5 nm and Catalyst 3: 7 nm</b>
Set 6	Pd-NP	monometallic	See Parameter Variation	activated Carbon	Norit SX Plus	0.1% w/w	<b>Catalysts 1: 3.5 nm; Catalysts 2: 5 nm and Catalyst 3: 7 nm</b>
Set 7	Au-NP	monometallic	See Parameter Variation	TiO <sub>2</sub> (anatase)	300 – 630 $\mu$ m	0.1% w/w	<b>Catalysts 1: 3.5 nm; Catalysts 2: 5 nm and Catalyst 3: 7 nm</b>
Set 8	Pt-NP	monometallic	See Parameter Variation	TiO <sub>2</sub> (anatase)	300 – 630 $\mu$ m	0.1% w/w	<b>Catalysts 1: 3.5 nm; Catalysts 2: 5 nm and Catalyst 3: 7 nm</b>

Set #	Noble Metal NP Species	Noble Metal NP Composition	NP-Size	Support Material	Support Size	loading	Parameter Variation
Set 9	Pd-NP	monometallic	See Parameter Variation	TiO <sub>2</sub> (anatase)	300 – 630 μm	0.1% w/w	<b>Catalysts 1: 3.5 nm; Catalysts 2: 5 nm and Catalyst 3: 7 nm</b>
Set 10	Au-NP	monometallic	See Parameter Variation	ZrO <sub>2</sub>	300 – 630 μm	0.1% w/w	<b>Catalysts 1: 3.5 nm; Catalysts 2: 5 nm and Catalyst 3: 7 nm</b>
Set 11	Pt-NP	monometallic	See Parameter Variation	ZrO <sub>2</sub>	300 – 630 μm	0.1% w/w	<b>Catalysts 1: 3.5 nm; Catalysts 2: 5 nm and Catalyst 3: 7 nm</b>
Set 12	Pd-NP	monometallic	See Parameter Variation	ZrO <sub>2</sub>	300 – 630 μm	0.1% w/w	<b>Catalysts 1: 3.5 nm; Catalysts 2: 5 nm and Catalyst 3: 7 nm</b>
Set 13	See Parameter Variation	monometallic	3.5 ± 0.5 nm	α-Al <sub>2</sub> O <sub>3</sub>	300 – 630 μm	0.1% w/w	<b>Catalysts 1: Au-NP, Catalyst 2: Pt-NP and Catalyst 3: Pd-NP</b>
Set 14	See Parameter Variation	monometallic	5 ± 0.5 nm	α-Al <sub>2</sub> O <sub>3</sub>	300 – 630 μm	0.1% w/w	<b>Catalysts 1: Au-NP, Catalyst 2: Pt-NP and Catalyst 3: Pd-NP</b>
Set 15	See Parameter Variation	monometallic	7 ± 1 nm	α-Al <sub>2</sub> O <sub>3</sub>	300 – 630 μm	0.1% w/w	<b>Catalysts 1: Au-NP, Catalyst 2: Pt-NP and Catalyst 3: Pd-NP</b>
Set 16	See Parameter Variation	monometallic	3.5 ± 0.5 nm	activated Carbon	Norit SX Plus	0.1% w/w	<b>Catalysts 1: Au-NP, Catalyst 2: Pt-NP and Catalyst 3: Pd-NP</b>
Set 17	See Parameter Variation	monometallic	5 ± 0.5 nm	activated Carbon	Norit SX Plus	0.1% w/w	<b>Catalysts 1: Au-NP, Catalyst 2: Pt-NP and Catalyst 3: Pd-NP</b>

Set #	Noble Metal NP Species	Noble Metal NP Composition	NP-Size	Support Material	Support Size	loading	Parameter Variation
Set 18	See Parameter Variation	monometallic	7 ± 1 nm	activated Carbon	Norit SX Plus	0.1% w/w	<b>Catalysts 1: Au-NP, Catalyst 2: Pt-NP and Catalyst 3: Pd-NP</b>
Set 19	See Parameter Variation	monometallic	3.5 ± 0.5 nm	TiO <sub>2</sub> (anatase)	300 – 630 μm	0.1% w/w	<b>Catalysts 1: Au-NP, Catalyst 2: Pt-NP and Catalyst 3: Pd-NP</b>
Set 20	See Parameter Variation	monometallic	5 ± 0.5 nm	TiO <sub>2</sub> (anatase)	300 – 630 μm	0.1% w/w	<b>Catalysts 1: Au-NP, Catalyst 2: Pt-NP and Catalyst 3: Pd-NP</b>
Set 21	See Parameter Variation	monometallic	7 ± 1 nm	TiO <sub>2</sub> (anatase)	300 – 630 μm	0.1% w/w	<b>Catalysts 1: Au-NP, Catalyst 2: Pt-NP and Catalyst 3: Pd-NP</b>
Set 22	See Parameter Variation	monometallic	3.5 ± 0.5 nm	ZrO <sub>2</sub>	300 – 630 μm	0.1% w/w	<b>Catalysts 1: Au-NP, Catalyst 2: Pt-NP and Catalyst 3: Pd-NP</b>
Set 23	See Parameter Variation	monometallic	5 ± 0.5 nm	ZrO <sub>2</sub>	300 – 630 μm	0.1% w/w	<b>Catalysts 1: Au-NP, Catalyst 2: Pt-NP and Catalyst 3: Pd-NP</b>
Set 24	See Parameter Variation	monometallic	7 ± 1 nm	ZrO <sub>2</sub>	300 – 630 μm	0.1% w/w	<b>Catalysts 1: Au-NP, Catalyst 2: Pt-NP and Catalyst 3: Pd-NP</b>
Set 25	See Parameter Variation	bimetallic	3.5 ± 0.5 nm	α-Al <sub>2</sub> O <sub>3</sub>	300 – 630 μm	0.1% w/w	Au/Pd (alloys) <b>Catalysts 1: 10/90 mol-%, Catalysts 2: 20/80 mol-% and Catalyst 3: 50/50 mol-%</b>
Set 26	See Parameter Variation	bimetallic	3.5 ± 0.5 nm	activated Carbon	Norit SX Plus	0.1% w/w	Au/Pd (alloys) <b>Catalysts 1: 10/90 mol-%, Catalysts 2: 20/80 mol-% and Catalyst 3: 50/50 mol-%</b>
Set 27	See Parameter Variation	bimetallic	3.5 ± 0.5 nm	TiO <sub>2</sub> (anatase)	300 – 630 μm	0.1% w/w	Au/Pd (alloys) <b>Catalysts 1: 10/90 mol-%, Catalysts 2: 20/80 mol-% and Catalyst 3: 50/50 mol-%</b>

Set #	Noble Metal NP Species	Noble Metal NP Composition	NP-Size	Support Material	Support Size	loading	Parameter Variation
Set 28	See Parameter Variation	bimetallic	3.5 ± 0.5 nm	ZrO <sub>2</sub>	300 – 630 μm	0.1% w/w	Au/Pd (alloys) <b>Catalysts 1:</b> 10/90 mol-%, <b>Catalysts 2:</b> 20/80 mol-% and <b>Catalyst 3:</b> 50/50 mol-%
Set 29	Au-NP	monometallic	3.5 ± 0.5 nm	See Parameter Variation	300 – 630 μm	0.1% w/w	<b>Catalyst 1:</b> activated Carbon*, <b>Catalyst 2:</b> α-Al <sub>2</sub> O <sub>3</sub> , <b>Catalyst 3:</b> TiO <sub>2</sub> (anatase) and <b>Catalyst 4:</b> ZrO <sub>2</sub>
Set 30	Au-NP	monometallic	5 ± 0.5 nm	See Parameter Variation	300 – 630 μm	0.1% w/w	<b>Catalyst 1:</b> activated Carbon*, <b>Catalyst 2:</b> α-Al <sub>2</sub> O <sub>3</sub> , <b>Catalyst 3:</b> TiO <sub>2</sub> (anatase) and <b>Catalyst 4:</b> ZrO <sub>2</sub>
Set 31	Au-NP	monometallic	7 ± 1 nm	See Parameter Variation	300 – 630 μm	0.1% w/w	<b>Catalyst 1:</b> activated Carbon*, <b>Catalyst 2:</b> α-Al <sub>2</sub> O <sub>3</sub> , <b>Catalyst 3:</b> TiO <sub>2</sub> (anatase) and <b>Catalyst 4:</b> ZrO <sub>2</sub>
Set 32	Pt-NP	monometallic	3.5 ± 0.5 nm	See Parameter Variation	300 – 630 μm	0.1% w/w	<b>Catalyst 1:</b> activated Carbon*, <b>Catalyst 2:</b> α-Al <sub>2</sub> O <sub>3</sub> , <b>Catalyst 3:</b> TiO <sub>2</sub> (anatase) and <b>Catalyst 4:</b> ZrO <sub>2</sub>
Set 33	Pt-NP	monometallic	5 ± 0.5 nm	See Parameter Variation	300 – 630 μm	0.1% w/w	<b>Catalyst 1:</b> activated Carbon*, <b>Catalyst 2:</b> α-Al <sub>2</sub> O <sub>3</sub> , <b>Catalyst 3:</b> TiO <sub>2</sub> (anatase) and <b>Catalyst 4:</b> ZrO <sub>2</sub>
Set 34	Pt-NP	monometallic	7 ± 1 nm	See Parameter Variation	300 – 630 μm	0.1% w/w	<b>Catalyst 1:</b> activated Carbon*, <b>Catalyst 2:</b> α-Al <sub>2</sub> O <sub>3</sub> , <b>Catalyst 3:</b> TiO <sub>2</sub> (anatase) and <b>Catalyst 4:</b> ZrO <sub>2</sub>
Set 35	Pd-NP	monometallic	3.5 ± 0.5 nm	See Parameter Variation	300 – 630 μm	0.1% w/w	<b>Catalyst 1:</b> activated Carbon*, <b>Catalyst 2:</b> α-Al <sub>2</sub> O <sub>3</sub> , <b>Catalyst 3:</b> TiO <sub>2</sub> (anatase) and <b>Catalyst 4:</b> ZrO <sub>2</sub>
Set 36	Pd-NP	monometallic	5 ± 0.5 nm	See Parameter Variation	300 – 630 μm	0.1% w/w	<b>Catalyst 1:</b> activated Carbon*, <b>Catalyst 2:</b> α-Al <sub>2</sub> O <sub>3</sub> , <b>Catalyst 3:</b> TiO <sub>2</sub> (anatase) and <b>Catalyst 4:</b> ZrO <sub>2</sub>

Set #	Noble Metal NP Species	Noble Metal NP Composition	NP-Size	Support Material	Support Size	loading	Parameter Variation
Set 37	Pd-NP	monometallic	7 ± 1 nm	See Parameter Variation	300 – 630 μm	0.1% w/w	<b>Catalyst 1:</b> activated Carbon*, <b>Catalyst 2:</b> α-Al <sub>2</sub> O <sub>3</sub> , <b>Catalyst 3:</b> TiO <sub>2</sub> (anatase) and <b>Catalyst 4:</b> ZrO <sub>2</sub>
Set 38	Au/Pd	10/90 mol-%	3.5 ± 0.5 nm	See Parameter Variation	300 – 630 μm	0.1% w/w	<b>Catalyst 1:</b> activated Carbon*, <b>Catalyst 2:</b> α-Al <sub>2</sub> O <sub>3</sub> , <b>Catalyst 3:</b> TiO <sub>2</sub> (anatase) and <b>Catalyst 4:</b> ZrO <sub>2</sub>
Set 39	Au/Pd	20/80 mol-%	3.5 ± 0.5 nm	See Parameter Variation	300 – 630 μm	0.1% w/w	<b>Catalyst 1:</b> activated Carbon*, <b>Catalyst 2:</b> α-Al <sub>2</sub> O <sub>3</sub> , <b>Catalyst 3:</b> TiO <sub>2</sub> (anatase) and <b>Catalyst 4:</b> ZrO <sub>2</sub>
Set 40	Au/Pd	50/50 mol-%	3.5 ± 0.5 nm	See Parameter Variation	300 – 630 μm	0.1% w/w	<b>Catalyst 1:</b> activated Carbon*, <b>Catalyst 2:</b> α-Al <sub>2</sub> O <sub>3</sub> , <b>Catalyst 3:</b> TiO <sub>2</sub> (anatase) and <b>Catalyst 4:</b> ZrO <sub>2</sub>

\*no Support Size Variation for activated Carbon, always Norit SX Plus Cat (from Cabot Corp.)

Set #	Noble Metal NP Species	Noble Metal NP Composition	NP-Size	Support Material	Support Size	loading	Parameter Variation
Set 41	Au-NP	monometallic	3.5 ± 0.5 nm	α-Al <sub>2</sub> O <sub>3</sub>	300 – 630 μm	See Parameter Variation	<b>Catalyst 1: 0.05% w/w, Catalyst 2: 0.10% w/w and Catalyst 3: 0.15% w/w</b>
Set 42	Pt-NP	monometallic	3.5 ± 0.5 nm	α-Al <sub>2</sub> O <sub>3</sub>	300 – 630 μm	See Parameter Variation	<b>Catalyst 1: 0.05% w/w, Catalyst 2: 0.10% w/w and Catalyst 3: 0.15% w/w</b>
Set 43	Pd-NP	monometallic	3.5 ± 0.5 nm	α-Al <sub>2</sub> O <sub>3</sub>	300 – 630 μm	See Parameter Variation	<b>Catalyst 1: 0.05% w/w, Catalyst 2: 0.10% w/w and Catalyst 3: 0.15% w/w</b>
Set 44	Au-NP	monometallic	3.5 ± 0.5 nm	activated Carbon	Norit SX Plus	See Parameter Variation	<b>Catalyst 1: 0.05% w/w, Catalyst 2: 0.10% w/w and Catalyst 3: 0.15% w/w</b>
Set 45	Pt-NP	monometallic	3.5 ± 0.5 nm	activated Carbon	Norit SX Plus	See Parameter Variation	<b>Catalyst 1: 0.05% w/w, Catalyst 2: 0.10% w/w and Catalyst 3: 0.15% w/w</b>
Set 46	Pd-NP	monometallic	3.5 ± 0.5 nm	activated Carbon	Norit SX Plus	See Parameter Variation	<b>Catalyst 1: 0.05% w/w, Catalyst 2: 0.10% w/w and Catalyst 3: 0.15% w/w</b>
Set 47	Au-NP	monometallic	3.5 ± 0.5 nm	TiO <sub>2</sub> (anatase)	300 – 630 μm	See Parameter Variation	<b>Catalyst 1: 0.05% w/w, Catalyst 2: 0.10% w/w and Catalyst 3: 0.15% w/w</b>
Set 48	Pt-NP	monometallic	3.5 ± 0.5 nm	TiO <sub>2</sub> (anatase)	300 – 630 μm	See Parameter Variation	<b>Catalyst 1: 0.05% w/w, Catalyst 2: 0.10% w/w and Catalyst 3: 0.15% w/w</b>
Set 49	Pd-NP	monometallic	3.5 ± 0.5 nm	TiO <sub>2</sub> (anatase)	300 – 630 μm	See Parameter Variation	<b>Catalyst 1: 0.05% w/w, Catalyst 2: 0.10% w/w and Catalyst 3: 0.15% w/w</b>
Set 50	Au-NP	monometallic	3.5 ± 0.5 nm	ZrO <sub>2</sub>	300 – 630 μm	See Parameter Variation	<b>Catalyst 1: 0.05% w/w, Catalyst 2: 0.10% w/w and Catalyst 3: 0.15% w/w</b>

Set #	Noble Metal NP Species	Noble Metal NP Composition	NP-Size	Support Material	Support Size	loading	Parameter Variation
Set 51	Pt-NP	monometallic	3.5 ± 0.5 nm	ZrO <sub>2</sub>	300 – 630 μm	See Parameter Variation	<b>Catalyst 1: 0.05% w/w, Catalyst 2: 0.10% w/w and Catalyst 3: 0.15% w/w</b>
Set 52	Pd-NP	monometallic	3.5 ± 0.5 nm	ZrO <sub>2</sub>	300 – 630 μm	See Parameter Variation	<b>Catalyst 1: 0.05% w/w, Catalyst 2: 0.10% w/w and Catalyst 3: 0.15% w/w</b>
Set 53	Au-NP	monometallic	5 ± 0.5 nm	α-Al <sub>2</sub> O <sub>3</sub>	300 – 630 μm	See Parameter Variation	<b>Catalyst 1: 0.05% w/w, Catalyst 2: 0.10% w/w and Catalyst 3: 0.15% w/w</b>
Set 54	Pt-NP	monometallic	5 ± 0.5 nm	α-Al <sub>2</sub> O <sub>3</sub>	300 – 630 μm	See Parameter Variation	<b>Catalyst 1: 0.05% w/w, Catalyst 2: 0.10% w/w and Catalyst 3: 0.15% w/w</b>
Set 55	Pd-NP	monometallic	5 ± 0.5 nm	α-Al <sub>2</sub> O <sub>3</sub>	300 – 630 μm	See Parameter Variation	<b>Catalyst 1: 0.05% w/w, Catalyst 2: 0.10% w/w and Catalyst 3: 0.15% w/w</b>
Set 56	Au-NP	monometallic	5 ± 0.5 nm	activated Carbon	Norit SX Plus	See Parameter Variation	<b>Catalyst 1: 0.05% w/w, Catalyst 2: 0.10% w/w and Catalyst 3: 0.15% w/w</b>
Set 57	Pt-NP	monometallic	5 ± 0.5 nm	activated Carbon	Norit SX Plus	See Parameter Variation	<b>Catalyst 1: 0.05% w/w, Catalyst 2: 0.10% w/w and Catalyst 3: 0.15% w/w</b>
Set 58	Pd-NP	monometallic	5 ± 0.5 nm	activated Carbon	Norit SX Plus	See Parameter Variation	<b>Catalyst 1: 0.05% w/w, Catalyst 2: 0.10% w/w and Catalyst 3: 0.15% w/w</b>
Set 59	Au-NP	monometallic	5 ± 0.5 nm	TiO <sub>2</sub> (anatase)	300 – 630 μm	See Parameter Variation	<b>Catalyst 1: 0.05% w/w, Catalyst 2: 0.10% w/w and Catalyst 3: 0.15% w/w</b>
Set 60	Pt-NP	monometallic	5 ± 0.5 nm	TiO <sub>2</sub> (anatase)	300 – 630 μm	See Parameter Variation	<b>Catalyst 1: 0.05% w/w, Catalyst 2: 0.10% w/w and Catalyst 3: 0.15% w/w</b>



Set #	Noble Metal NP Species	Noble Metal NP Composition	NP-Size	Support Material	Support Size	loading	Parameter Variation
Set 61	Pd-NP	monometallic	5 ± 0.5 nm	TiO <sub>2</sub> (anatase)	300 – 630 μm	See Parameter Variation	<b>Catalyst 1: 0.05% w/w, Catalyst 2: 0.10% w/w and Catalyst 3: 0.15% w/w</b>
Set 62	Au-NP	monometallic	5 ± 0.5 nm	ZrO <sub>2</sub>	300 – 630 μm	See Parameter Variation	<b>Catalyst 1: 0.05% w/w, Catalyst 2: 0.10% w/w and Catalyst 3: 0.15% w/w</b>
Set 63	Pt-NP	monometallic	5 ± 0.5 nm	ZrO <sub>2</sub>	300 – 630 μm	See Parameter Variation	<b>Catalyst 1: 0.05% w/w, Catalyst 2: 0.10% w/w and Catalyst 3: 0.15% w/w</b>
Set 64	Pd-NP	monometallic	5 ± 0.5 nm	ZrO <sub>2</sub>	300 – 630 μm	See Parameter Variation	<b>Catalyst 1: 0.05% w/w, Catalyst 2: 0.10% w/w and Catalyst 3: 0.15% w/w</b>
Set 65	Au-NP	monometallic	7 ± 1 nm	α-Al <sub>2</sub> O <sub>3</sub>	300 – 630 μm	See Parameter Variation	<b>Catalyst 1: 0.05% w/w, Catalyst 2: 0.10% w/w and Catalyst 3: 0.15% w/w</b>
Set 66	Pt-NP	monometallic	7 ± 1 nm	α-Al <sub>2</sub> O <sub>3</sub>	300 – 630 μm	See Parameter Variation	<b>Catalyst 1: 0.05% w/w, Catalyst 2: 0.10% w/w and Catalyst 3: 0.15% w/w</b>
Set 67	Pd-NP	monometallic	7 ± 1 nm	α-Al <sub>2</sub> O <sub>3</sub>	300 – 630 μm	See Parameter Variation	<b>Catalyst 1: 0.05% w/w, Catalyst 2: 0.10% w/w and Catalyst 3: 0.15% w/w</b>
Set 68	Au-NP	monometallic	7 ± 1 nm	activated Carbon	Norit SX Plus	See Parameter Variation	<b>Catalyst 1: 0.05% w/w, Catalyst 2: 0.10% w/w and Catalyst 3: 0.15% w/w</b>
Set 69	Pt-NP	monometallic	7 ± 1 nm	activated Carbon	Norit SX Plus	See Parameter Variation	<b>Catalyst 1: 0.05% w/w, Catalyst 2: 0.10% w/w and Catalyst 3: 0.15% w/w</b>

Set #	Noble Metal NP Species	Noble Metal NP Composition	NP-Size	Support Material	Support Size	loading	Parameter Variation
Set 70	Pd-NP	monometallic	7 ± 1 nm	activated Carbon	Norit SX Plus	See Parameter Variation	<b>Catalyst 1: 0.05% w/w, Catalyst 2: 0.10% w/w and Catalyst 3: 0.15% w/w</b>
Set 71	Au-NP	monometallic	7 ± 1 nm	TiO <sub>2</sub> (anatase)	300 – 630 μm	See Parameter Variation	<b>Catalyst 1: 0.05% w/w, Catalyst 2: 0.10% w/w and Catalyst 3: 0.15% w/w</b>
Set 72	Pt-NP	monometallic	7 ± 1 nm	TiO <sub>2</sub> (anatase)	300 – 630 μm	See Parameter Variation	<b>Catalyst 1: 0.05% w/w, Catalyst 2: 0.10% w/w and Catalyst 3: 0.15% w/w</b>
Set 73	Pd-NP	monometallic	7 ± 1 nm	TiO <sub>2</sub> (anatase)	300 – 630 μm	See Parameter Variation	<b>Catalyst 1: 0.05% w/w, Catalyst 2: 0.10% w/w and Catalyst 3: 0.15% w/w</b>
Set 74	Au-NP	monometallic	7 ± 1 nm	ZrO <sub>2</sub>	300 – 630 μm	See Parameter Variation	<b>Catalyst 1: 0.05% w/w, Catalyst 2: 0.10% w/w and Catalyst 3: 0.15% w/w</b>
Set 75	Pt-NP	monometallic	7 ± 1 nm	ZrO <sub>2</sub>	300 – 630 μm	See Parameter Variation	<b>Catalyst 1: 0.05% w/w, Catalyst 2: 0.10% w/w and Catalyst 3: 0.15% w/w</b>
Set 76	Pd-NP	monometallic	7 ± 1 nm	ZrO <sub>2</sub>	300 – 630 μm	See Parameter Variation	<b>Catalyst 1: 0.05% w/w, Catalyst 2: 0.10% w/w and Catalyst 3: 0.15% w/w</b>
Set 77	Au/Pd	10/90 mol-%	3.5 ± 0.5 nm	α-Al <sub>2</sub> O <sub>3</sub>	300 – 630 μm	See Parameter Variation	<b>Catalyst 1: 0.05% w/w, Catalyst 2: 0.10% w/w and Catalyst 3: 0.15% w/w</b>
Set 78	Au/Pd	20/80 mol-%	3.5 ± 0.5 nm	α-Al <sub>2</sub> O <sub>3</sub>	300 – 630 μm	See Parameter Variation	<b>Catalyst 1: 0.05% w/w, Catalyst 2: 0.10% w/w and Catalyst 3: 0.15% w/w</b>

Set #	Noble Metal NP Species	Noble Metal NP Composition	NP-Size	Support Material	Support Size	loading	Parameter Variation
Set 79	Au/Pd	50/50 mol-%	3.5 ± 0.5 nm	α-Al <sub>2</sub> O <sub>3</sub>	300 – 630 μm	See Parameter Variation	<b>Catalyst 1: 0.05% w/w, Catalyst 2: 0.10% w/w and Catalyst 3: 0.15% w/w</b>
Set 80	Au/Pd	10/90 mol-%	3.5 ± 0.5 nm	activated Carbon	Norit SX Plus	See Parameter Variation	<b>Catalyst 1: 0.05% w/w, Catalyst 2: 0.10% w/w and Catalyst 3: 0.15% w/w</b>
Set 81	Au/Pd	20/80 mol-%	3.5 ± 0.5 nm	activated Carbon	Norit SX Plus	See Parameter Variation	<b>Catalyst 1: 0.05% w/w, Catalyst 2: 0.10% w/w and Catalyst 3: 0.15% w/w</b>
Set 82	Au/Pd	50/50 mol-%	3.5 ± 0.5 nm	activated Carbon	Norit SX Plus	See Parameter Variation	<b>Catalyst 1: 0.05% w/w, Catalyst 2: 0.10% w/w and Catalyst 3: 0.15% w/w</b>
Set 83	Au/Pd	10/90 mol-%	3.5 ± 0.5 nm	TiO <sub>2</sub> (anatase)	300 – 630 μm	See Parameter Variation	<b>Catalyst 1: 0.05% w/w, Catalyst 2: 0.10% w/w and Catalyst 3: 0.15% w/w</b>
Set 84	Au/Pd	20/80 mol-%	3.5 ± 0.5 nm	TiO <sub>2</sub> (anatase)	300 – 630 μm	See Parameter Variation	<b>Catalyst 1: 0.05% w/w, Catalyst 2: 0.10% w/w and Catalyst 3: 0.15% w/w</b>
Set 85	Au/Pd	50/50 mol-%	3.5 ± 0.5 nm	TiO <sub>2</sub> (anatase)	300 – 630 μm	See Parameter Variation	<b>Catalyst 1: 0.05% w/w, Catalyst 2: 0.10% w/w and Catalyst 3: 0.15% w/w</b>
Set 86	Au/Pd	10/90 mol-%	3.5 ± 0.5 nm	ZrO <sub>2</sub>	300 – 630 μm	See Parameter Variation	<b>Catalyst 1: 0.05% w/w, Catalyst 2: 0.10% w/w and Catalyst 3: 0.15% w/w</b>
Set 87	Au/Pd	20/80 mol-%	3.5 ± 0.5 nm	ZrO <sub>2</sub>	300 – 630 μm	See Parameter Variation	<b>Catalyst 1: 0.05% w/w, Catalyst 2: 0.10% w/w and Catalyst 3: 0.15% w/w</b>
Set 88	Au/Pd	50/50 mol-%	3.5 ± 0.5 nm	ZrO <sub>2</sub>	300 – 630 μm	See Parameter Variation	<b>Catalyst 1: 0.05% w/w, Catalyst 2: 0.10% w/w and Catalyst 3: 0.15% w/w</b>

Set #	Noble Metal NP Species	Noble Metal NP Composition	NP-Size	Support Material	Support Size	loading	Parameter Variation
Set X	Au-NP; Pt-NP; Pd-NP; Au/Pd-NP (alloys)	Monometallic or bimetallic (10/90, 20/80, 50/50 mol-%)	3.5 ± 0.5 nm; 5 ± 0.5 nm; 7 ± 1 nm	activated Carbon; α-Al <sub>2</sub> O <sub>3</sub> ; TiO <sub>2</sub> (anatase); ZrO <sub>2</sub>	See Parameter Variation	0.05% w/w; 0.10% w/w; 0.15% w/w	160 – 1250 μm; Pellets (on demand)*

\*no Support Size Variation for activated Carbon, always Norit SX Plus Cat (from Cabot Corp.)