Supplementary material

Movie S1.

A movie shows the galvanic replacement reaction between a drop of galinstan and 7.0 mM K_2PtCl_4 for an experimental duration of 4 minutes, however the speed of the presented video is increased by a factor of 4.

Table S1. Sample names for GaInSn droplet reacted with platinum salt with varying concentration in different media.

Sample Name	Concentration of K_2PtCl_4 (mM)	Deionised water	
PtGa-1a	7.0	✓	
PtGa-1b	5.0	✓	
PtGa-1c	2.5	✓	
PtGa-1d	1.0	✓	
PtGa-2a	7.0		✓
PtGa-2b	5.0		✓
PtGa-2c	2.5		✓
PtGa-2d	1.0		✓

Table S2. The absorption energies of different stable sites around surface Ga atoms for CO on Pt(111), $Pt_{35}Ga_1$ (111), $Pt_{34}Ga_2$ (111) and $Pt_{33}Ga_3$ (111) in a 3×3 Pt(111) slab.

configuration	Site	$E_{absorption}$ (eV)	marker
Pt_{36}_CO	Top	-2.08	square
	Bridge	-2.16	circle
	fcc hollow	-2.21	pentagon
	hcp hollow	-2.16	triangle
$Pt_{35}Ga_1$_CO	Top	-0.53	square
	Bridge	-0.52	circle
	fcc hollow	-0.52	pentagon
	hcp hollow	-0.52	triangle
$Pt_{34}Ga_2$_CO	Top	-0.45	square
	bridge_1	-0.44	circle
	bridge_2	-0.46	circle
$Pt_{33}Ga_3$_CO	Top	-0.45	square
	bridge_1	-0.47	circle
	bridge_2	-0.44	circle

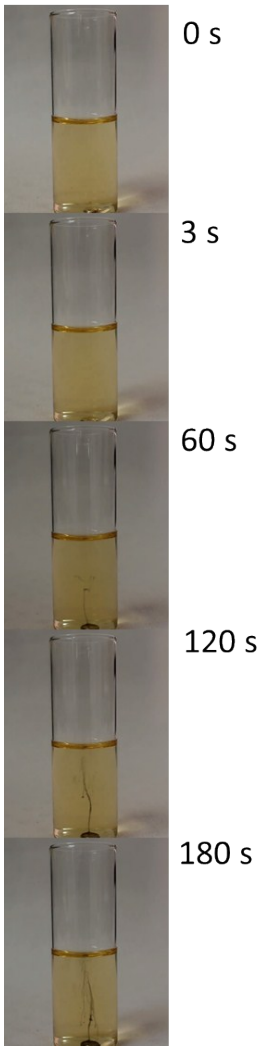

Figure S1: Digital images of the galvanic replacement reaction between galinstan and an aqueous solution of 7 mM K_2PtCl_4 at different times.

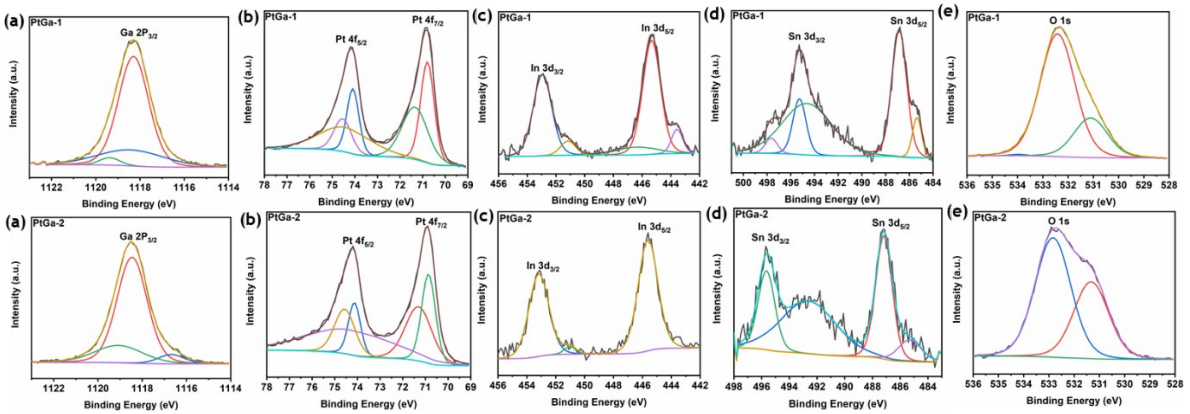

Figure S2. XPS spectra of PtGa-1 nanoparticle. (a & b) Ga 2p (c & d) Pt 4f (e & f) In 3d (g & h) Sn 3d (i & j) O 1s.

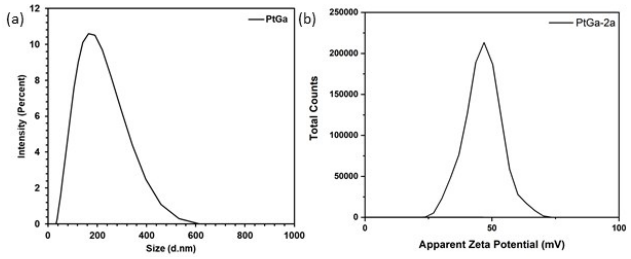

Figure S3. (a) The particle size average and (b) zeta potential value for PtGa-2.

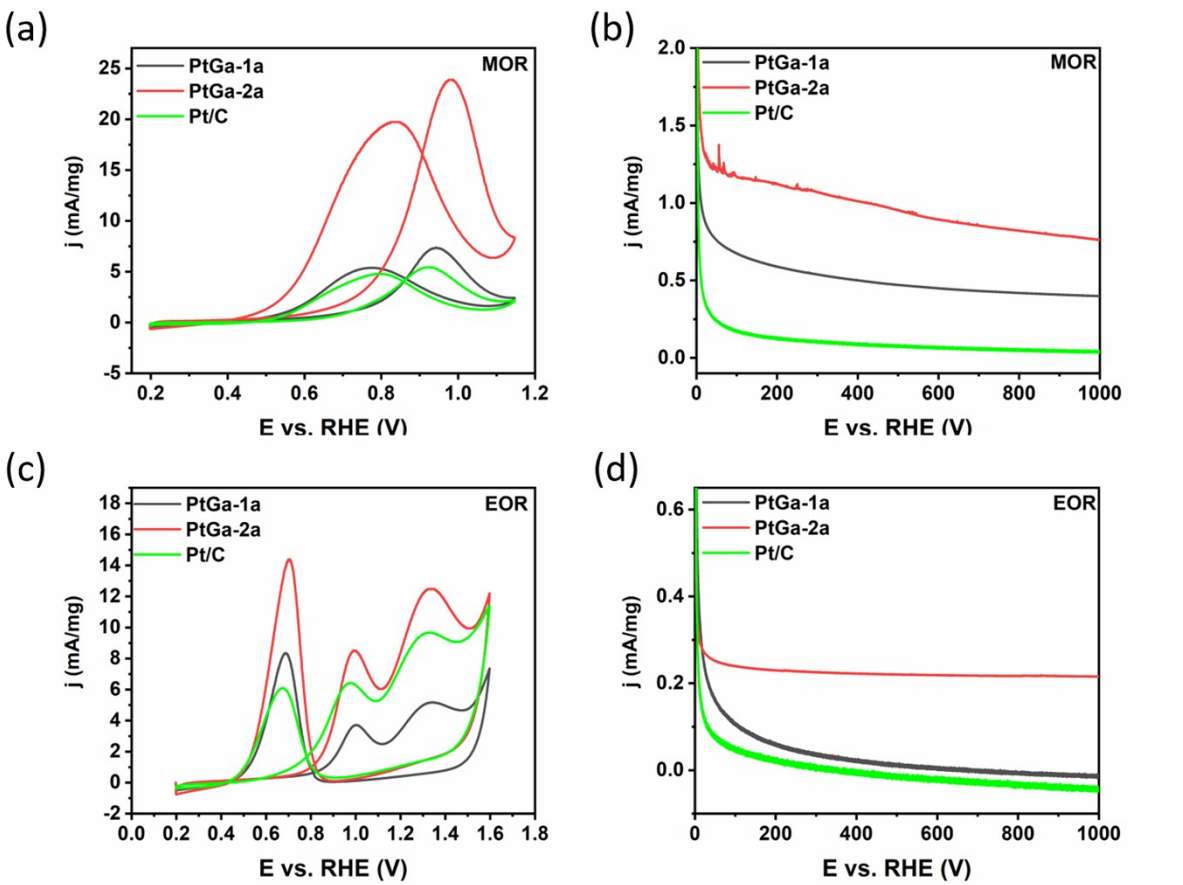

Figure S4. Cyclic voltammograms recorded at 20 mV s^{-1} in 1 M H_2SO_4 containing (a) 1 M methanol and (c) 1 M ethanol for samples PtGa-1a, PtGa-2a and Pt/C. Chronoamperometric responses recorded at 1.1 V in 1 M H_2SO_4 containing (b) 1 M methanol and (d) 1 M ethanol for samples PtGa-1a, PtGa-2a and Pt/C.

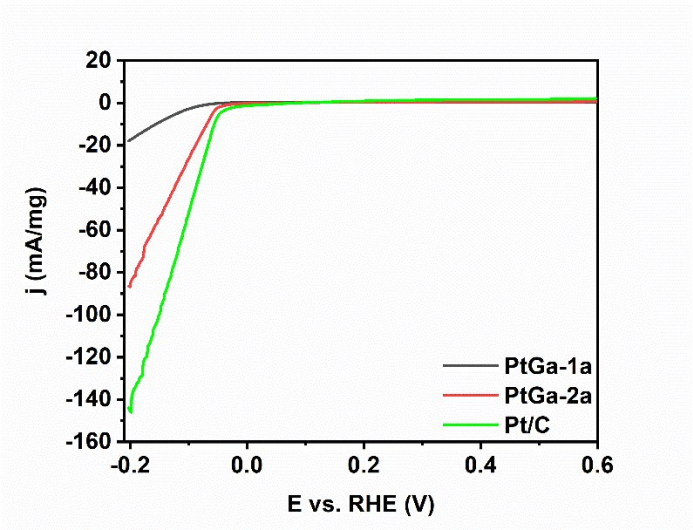

Figure S5: Linear sweep voltammograms recorded at 20 mV s^{-1} for PtGa-1, PtGa-2 and Pt/C in 1 M H_2SO_4