

Supplementary Materials:

**Gd₂O₃ assisted Synthesis of Carbon-Supported Pt
Electrocatalytic for Oxygen Reduction Reaction**

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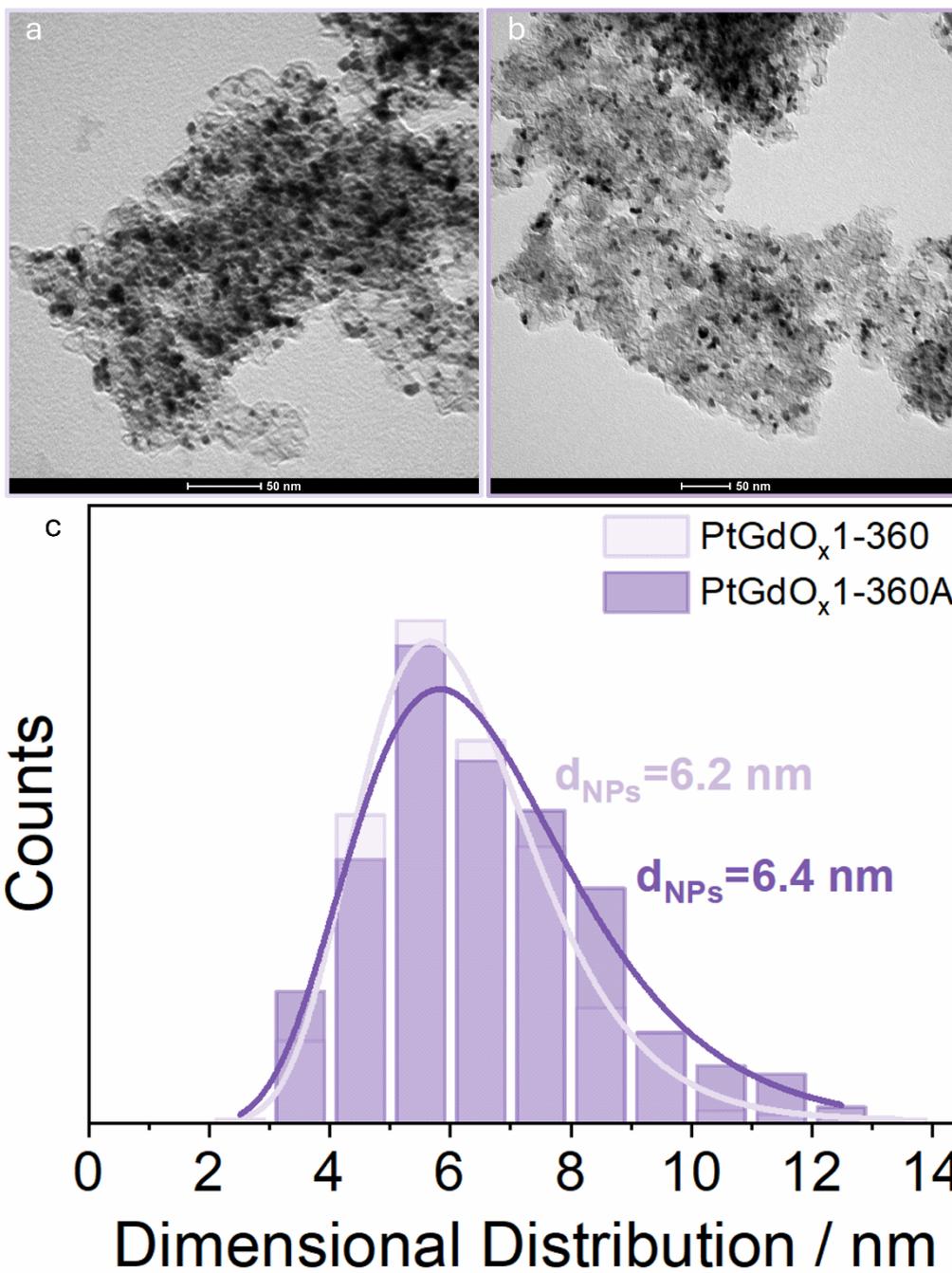


Figure S1: TEM images for a) the pristine PtGdO_x1-360 and b) acid treated PtGdO_x1-360; c) dimensional distribution for the PtGdO_x1-360 before and after the acid wash treatment.

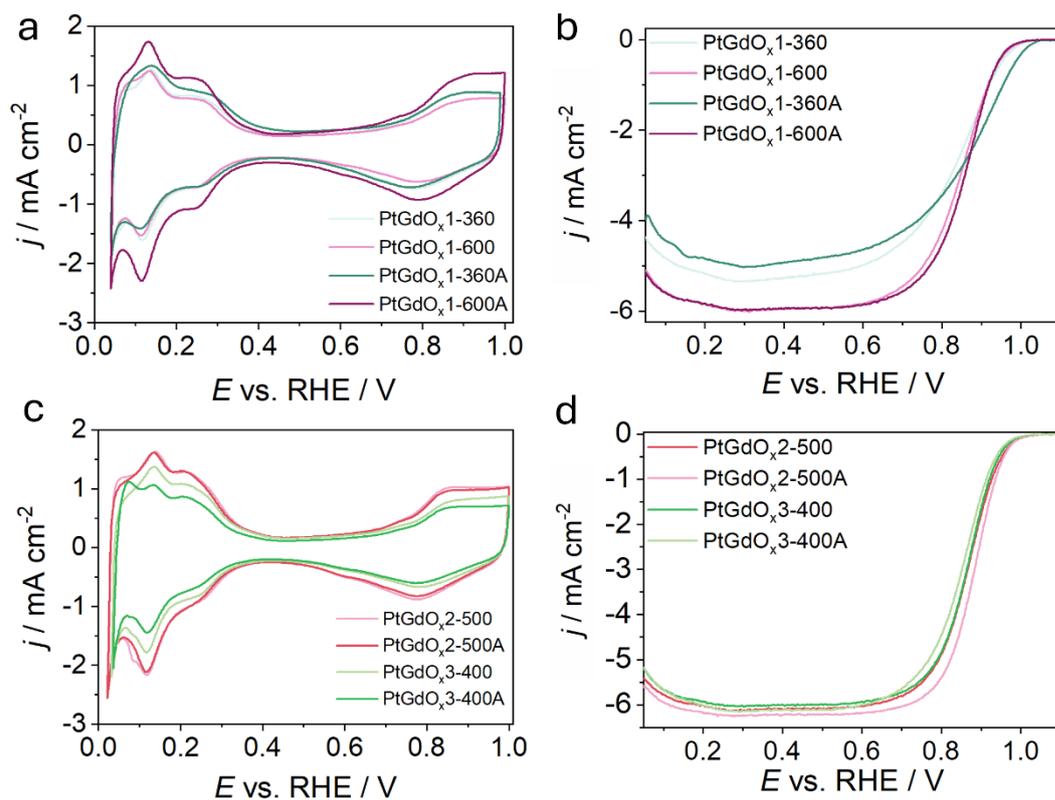


Figure S 2 CVs recorded at a scan rate of 50 mV s^{-1} in Ar saturated HClO_4 0.1 M solution and b) LSV with RDE at 1600 rpm and 20 mV s^{-1} in O_2 saturated electrolyte for the catalysts synthesized using $\text{Pt}(\text{acac})_2$ and GdCl_3 (1). CVs recorded at a scan rate of 50 mV s^{-1} in Argon saturated HClO_4 0.1 M solution and b) LSV with RDE at 1600 rpm and 20 mV s^{-1} in O_2 saturated electrolyte for the catalysts synthesized $\text{Pt}(\text{acac})_2$ and $\text{Gd}(\text{NO}_3)_3$ (2), $\text{Gd}(\text{acac})_3$ and $\text{Gd}(\text{ac})_3$ (3).

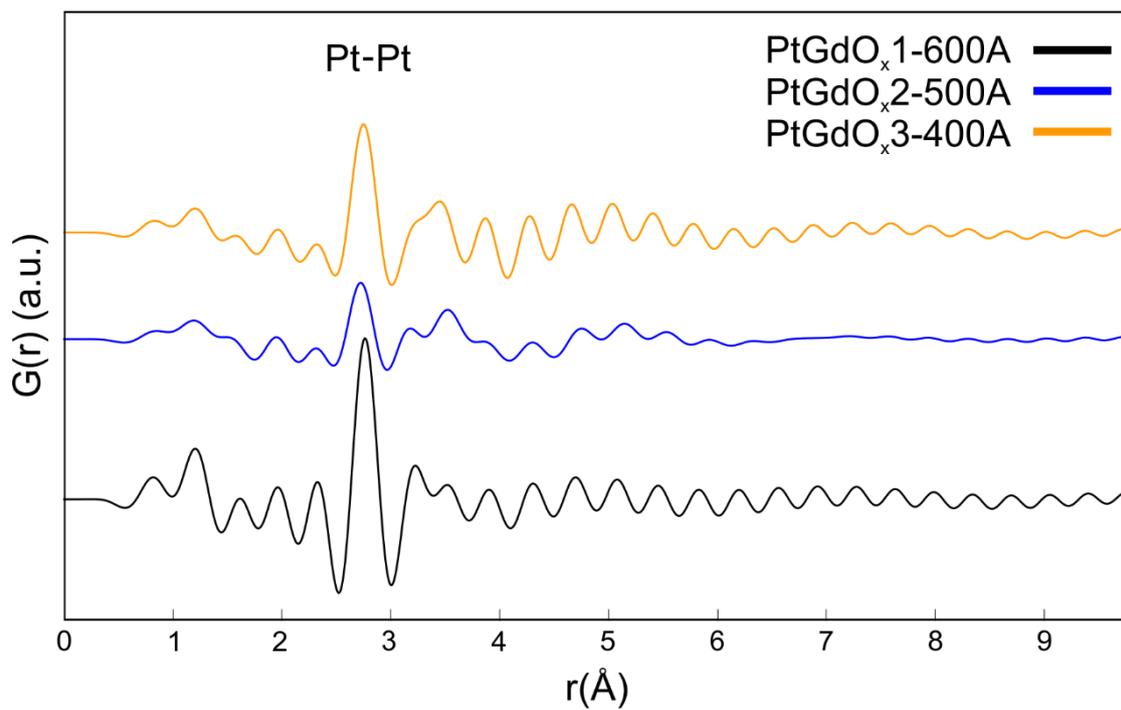


Figure S 3. PDF of the polynomial curves added as a background component in the DSE analysis of PtGdO_x1-600A, PtGdO_x2-500A and PtGdO_x3-400A (as reported in Fig. 3). Pt-Pt distance at ~2.76 Å is highlighted.

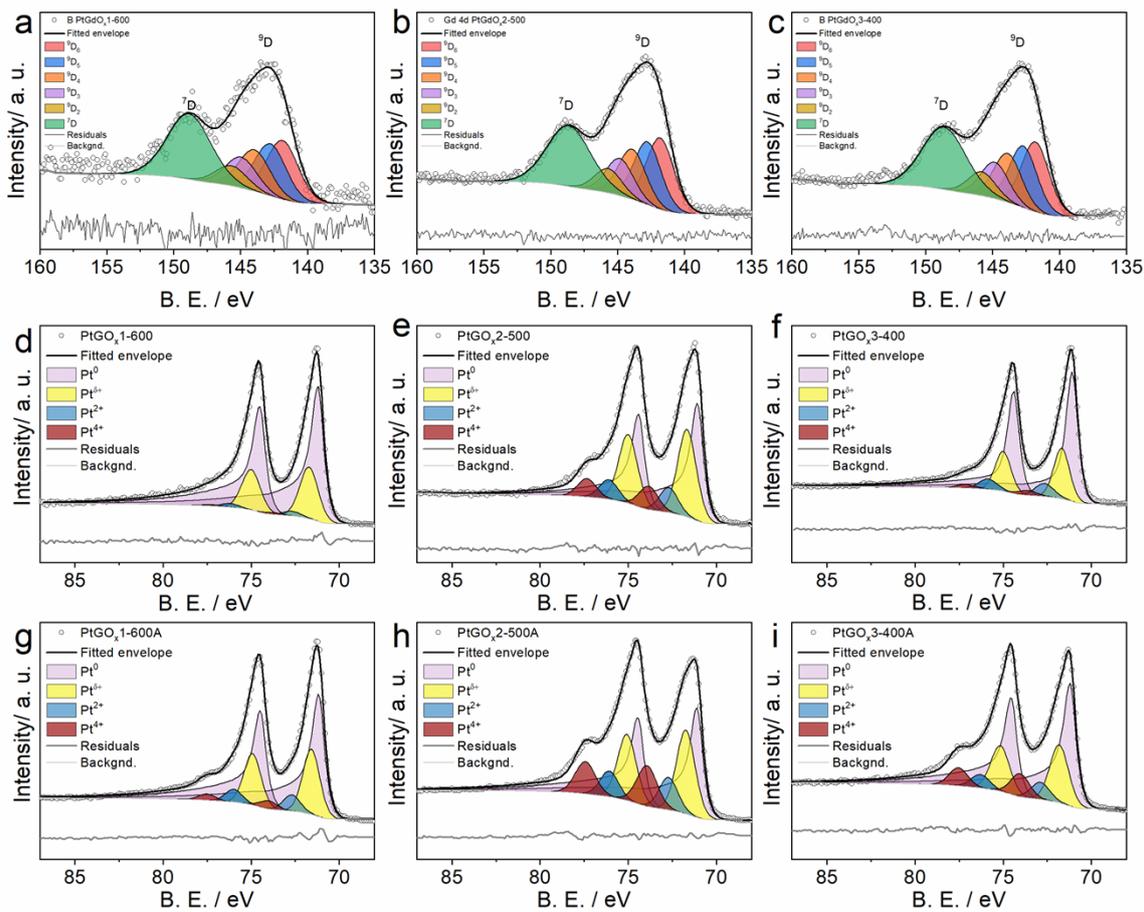


Figure S 4 Gd 4d XPS region and deconvolution for a) PtGdO_x1-600, b) PtGdO_x2-500, c) PtGdO_x3-400. Pt 4f XPS region and deconvolution for d) PtGdO_x1-600, e) PtGdO_x2-500, f) PtGdO_x3-400, g) PtGdO_x1-600A, h) PtGdO_x2-500A, i) PtGdO_x3-400A.

Table S1: Relative percentages of the different Platinum species obtained by fitting of the Pt 4f photoemission region.

Pt 4f	Pt ⁰ %	Pt ²⁺ %	Pt ²⁺ %	Pt ⁴⁺ %
PtGdO _x 1-600A	72.1	21.1	3.9	3.0
PtGdO _x 1-600	76.8	20.8	1.9	0.5
PtGdO _x 2-500A	50.4	25.9	10.1	16.6
PtGdO _x 2-500	54.7	29.1	8.3	7.9
PtGdO _x 3-400A	63.4	21.8	6.4	8.4
PtGdO _x 3-400	68.9	23.6	5.1	2.4
PtGdO _x 1-360A	72.6	20.4	3.6	3.4
PtGdO _x 1-360	74.3	23.4	1.4	0.9

Table S2 Fitting parameters for the Pt 4f region.

	Peak	BE (eV)	Area	FWHM (eV)	L/G Mix (%)	Tail Mix (%)	Tail Height (%)	Tail Exponent
A	Pt ⁰ 4f _{7/2}	free	free	0.79 (fixed)	76.6 (fixed)	61.98 (fixed)	0.13 (fixed)	0.0334 (fixed)
B	Pt ⁰ 4f _{5/2}	A+3.3 (±0.1)	A*0.75	A*1	A*1	A*1	A*1	A*1
C	Pt ^{δ+} 4f _{7/2}	free	free	0.5:1.5	30 (fixed)	100 (fixed)	0 (fixed)	0 (fixed)
D	Pt ^{δ+} 4f _{5/2}	C+3.3 (±0.1)	C*0.75	C*1	C*1	C*1	C*1	C*1
E	Pt ²⁺ 4f _{7/2}	free	free	C*1 (±0.1)	30 (fixed)	100 (fixed)	0 (fixed)	0 (fixed)
F	Pt ²⁺ 4f _{5/2}	E+3.3 (±0.1)	E*0.75	E*1	E*1	E*1	E*1	E*1
G	Pt ⁴⁺ 4f _{7/2}	free	free	C*1 (±0.1)	30 (fixed)	100 (fixed)	0 (fixed)	0 (fixed)
H	Pt ⁴⁺ 4f _{5/2}	G+3.3 (±0.1)	G*0.75	G*1	G*1	G*1	G*1	G*1

Table S3: Fitting parameters for the Gd 4d region.

Peak	BE (eV)	Area	FWHM (eV)	L/G Mix (%)	Tail Mix (%)	Tail Height (%)	Tail Exponent	
A	${}^9\text{D}\bar{J}=2$	free	free	0.5:4 [§]	30 (fixed)	100 (fixed)	0 (fixed)	0 (fixed)
B	${}^9\text{D}\bar{J}=2$	A+1.0 (±0.1)	A*088	A*1	30 (fixed)	100 (fixed)	0 (fixed)	0 (fixed)
C	${}^9\text{D}\bar{J}=4$	A+2.0 (±0.1)	A*0.70	A*1	30 (fixed)	100 (fixed)	0 (fixed)	0 (fixed)
D	${}^9\text{D}\bar{J}=5$	A+3.0 (±0.1)	A*0.52	A*1	30 (fixed)	100 (fixed)	0 (fixed)	0 (fixed)
E	${}^9\text{D}\bar{J}=6$	A+3.9 (±0.1)	A*0.34	A*1	30 (fixed)	100 (fixed)	0 (fixed)	0 (fixed)
F	${}^7\text{D}$	free	free	0.5:4 [#]	30 (fixed)	100 (fixed)	0 (fixed)	0 (fixed)

§ FWHM for peaks A-E is 2.40 eV for sample PtGO_x1-600, 2.47 eV for sample PtGO_x2-500 and 2.43 eV for sample PtGO_x3-400.

FWHM for peak F is 3.82 for all samples.