Supporting Information

Effect of Fe-N-Cs as Catalytic Active Support for Platinum towards ORR in Acidic Environment

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Supplementary Figures

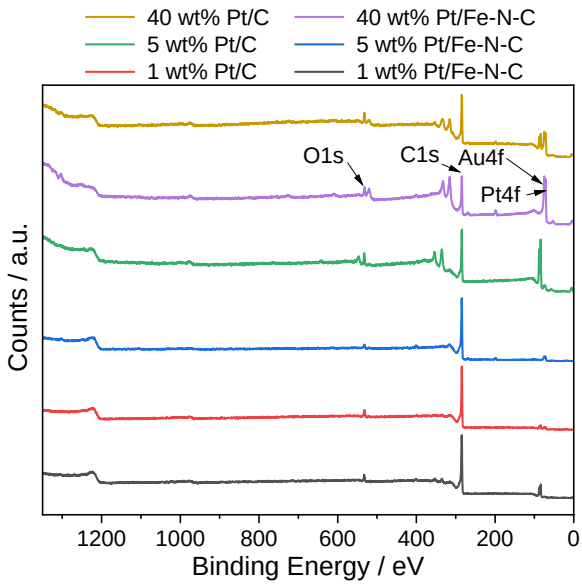

Figure S1. XP survey spectra.

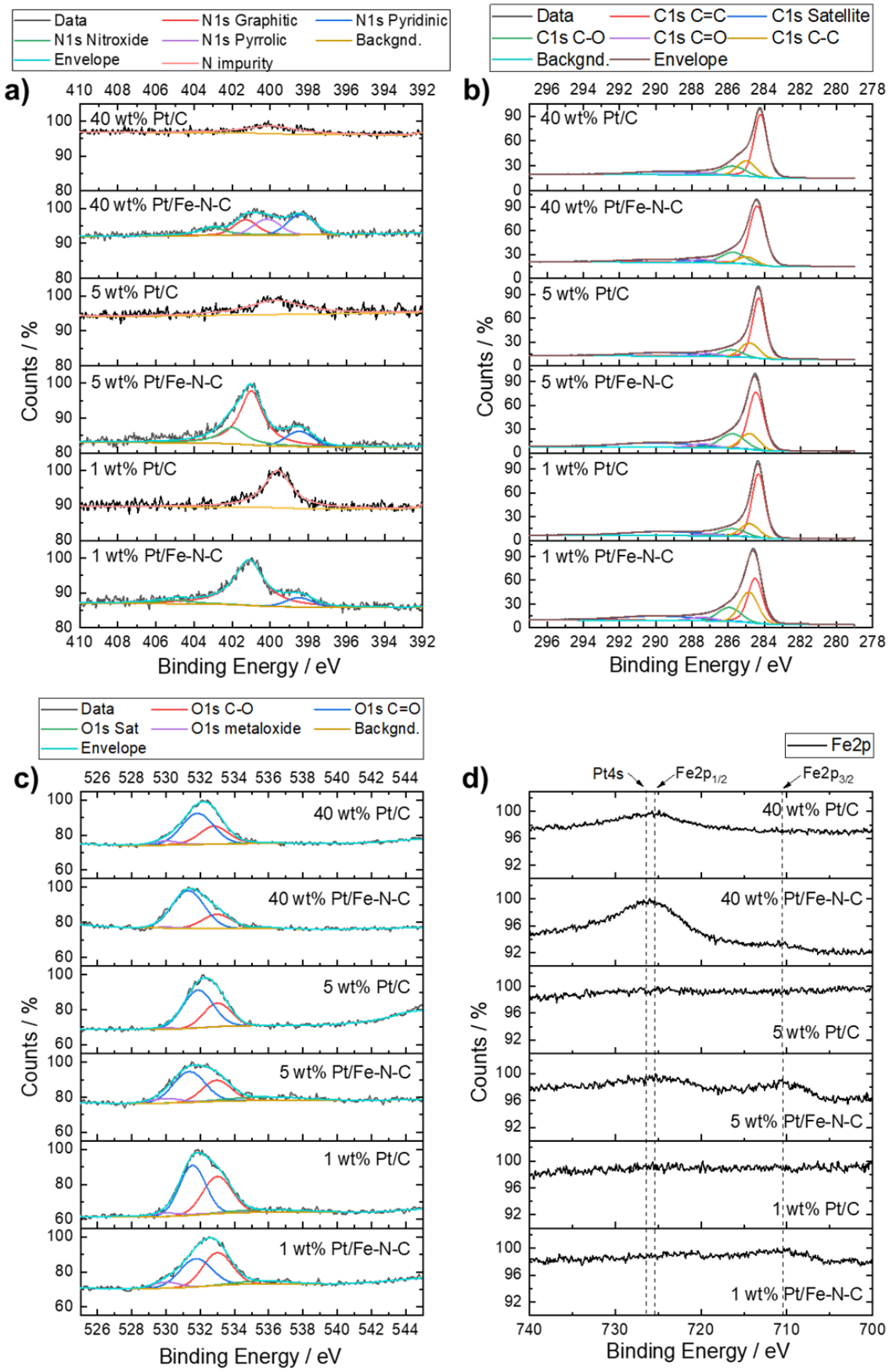

Figure S2. High resolution XPS of a) N1s, b) C1s, c) O1s and d) Fe2p.

Supplementary Tables

Table S1: Pt^0 peak positions of 1, 5, 40 wt% Pt/Cs and Pt/Fe-N-Cs from XP spectra.

	Binding energies / eV					
	1 wt% Pt/C	1 wt% Pt/Fe-N-C	5 wt% Pt/C	5 wt% Pt/Fe-N-C	40 wt% Pt/C	40 wt% Pt/Fe-N-C
Pt^0 $4f_{7/2}$	71.21	71.30	71.50	71.86	71.35	71.61
Pt^0 $4f_{5/2}$	74.41	74.50	74.55	75.06	74.40	74.51
Δ (Pt^0 $4f_{7/2}$)	0.09		0.36		0.26	
Δ (Pt^0 $4f_{5/2}$)	0.09		0.51		0.11	

Table S2: Element amount fractions of 1, 5, 40 wt% Pt/Cs and Pt/Fe-N-Cs determined via XPS.

	1 wt% Pt/C	5 wt% Pt/C	40 wt% Pt/C	1 wt% Pt/Fe-N-C	5 wt% Pt/Fe-N-C	40 wt% Pt/Fe-N-C
Pyridinic N / at%	-	-	-	1.6	0.8	2.0
Pyrrolic N / at%	-	-	-	5.2	0.0	3.6
Graphitic N / at%	-	-	-	1.5	3.2	1.7
Nitroxide / at%	-	-	-	1.2	1.0	1.3
N content / at%	3.1	2.6	1.8	9.5	4.9	8.5
O content / at%	12.7	10.6	9.4	12.4	2.7	9.9
C content / at%	83.6	85.8	83.0	70.7	91.6	72.6
Pt^0 content / at%	0.3	0.1	3.6	2.2	0.4	3.9
Pt^{2+} content / at%	0.3	0.8	1.4	4.4	0.2	3.9
Pt^{4+} content / at%	0.0	0.0	1.0	0.8	0.1	1.2
Pt content / at%	0.6	0.9	5.9	7.4	0.8	9.0
Sum / at%	100	100	100	100	100	100

Table S3: Mass activities of 1, 5, 40 wt% Pt/Cs and Pt/Fe-N-Cs at 0.9 V_{RHE}.

Mass Activity @0.9 V normalized by mass of Pt					
MA_{Pt} / A g_{Pt}^{-1}	Before AST	SD	After AST	SD	Loss / %
1 wt% Pt/C	111.73	103.46	65.09	61.06	42
1 wt% Pt/Fe-N-C	36.90	21.76	15.15	8.50	59
5 wt% Pt/C	357.62	19.33	82.57	36.85	77
5 wt% Pt/Fe-N-C	170.78	80.42	51.03	26.08	70
40 wt% Pt/C	351.74	34.24	76.77	8.38	78
40 wt% Pt/Fe-N-C	222.53	41.19	58.00	23.29	74
Fe-N-C	-	-	-	-	-
Mass Activity @0.9 V normalized by total mass of catalyst					
MA_{total} / A g_{total}^{-1}	Before AST	SD	After AST	SD	Loss / %
1 wt% Pt/C	0.40	0.37	0.23	0.22	42
1 wt% Pt/Fe-N-C	0.50	0.30	0.20	0.12	59
5 wt% Pt/C	13.48	0.73	3.11	1.39	77
5 wt% Pt/Fe-N-C	10.23	4.81	3.06	1.57	70
40 wt% Pt/C	135.70	13.21	29.62	3.24	78
40 wt% Pt/Fe-N-C	84.87	15.71	22.12	8.88	74
Fe-N-C	0.08	0.04	0.06	0.04	27

Table S4: Mass activities of 1, 5, 40 wt% Pt/Cs and Pt/Fe-N-Cs at 0.7 V_{RHE}.

Mass Activity @0.7 V normalized by mass of Pt					
MA_{Pt} / A g_{Pt}^{-1}	Before AST	SD	After AST	SD	Loss / %
1 wt% Pt/C	3664.52	2331.45	1548.28	1531.79	58
1 wt% Pt/Fe-N-C	2099.60	2248.31	847.29	618.6	60
5 wt% Pt/C	14950.98	1024.81	1986.49	326.14	87
5 wt% Pt/Fe-N-C	6739.31	2458.86	1614.03	145.23	76
40 wt% Pt/C	20036.82	6893.72	5665.66	1418.16	72
40 wt% Pt/Fe-N-C	6910.21	908.29	2675.58	638.76	61
Fe-N-C	-	-	-	-	-
Mass Activity @0.7 V normalized by total mass of catalyst					
MA_{total} / A g_{total}^{-1}	Before AST	SD	After AST	SD	Loss / %
1 wt% Pt/C	13.19	8.39	5.58	5.51	58
1 wt% Pt/Fe-N-C	28.56	30.58	11.52	8.42	60
5 wt% Pt/C	563.65	38.64	74.89	12.30	87
5 wt% Pt/Fe-N-C	403.68	147.29	96.68	8.70	76
40 wt% Pt/C	7730.20	2659.60	2185.81	547.13	72
40 wt% Pt/Fe-N-C	2635.55	346.42	1020.47	243.62	61
Fe-N-C	6.89	1.71	4.18	0.92	39