Electronic Supplementary Information (ESI) for

Tuning the Oxygen Reduction Activity of the Pt-Ni Nanoparticles under Specific Anion Adsorption by Varying Heat Treatment Atmosphere

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S1. Supplementary Half-Cell Data

S1.1. Cyclic voltamograms of Pt and PtNi nanoparticles

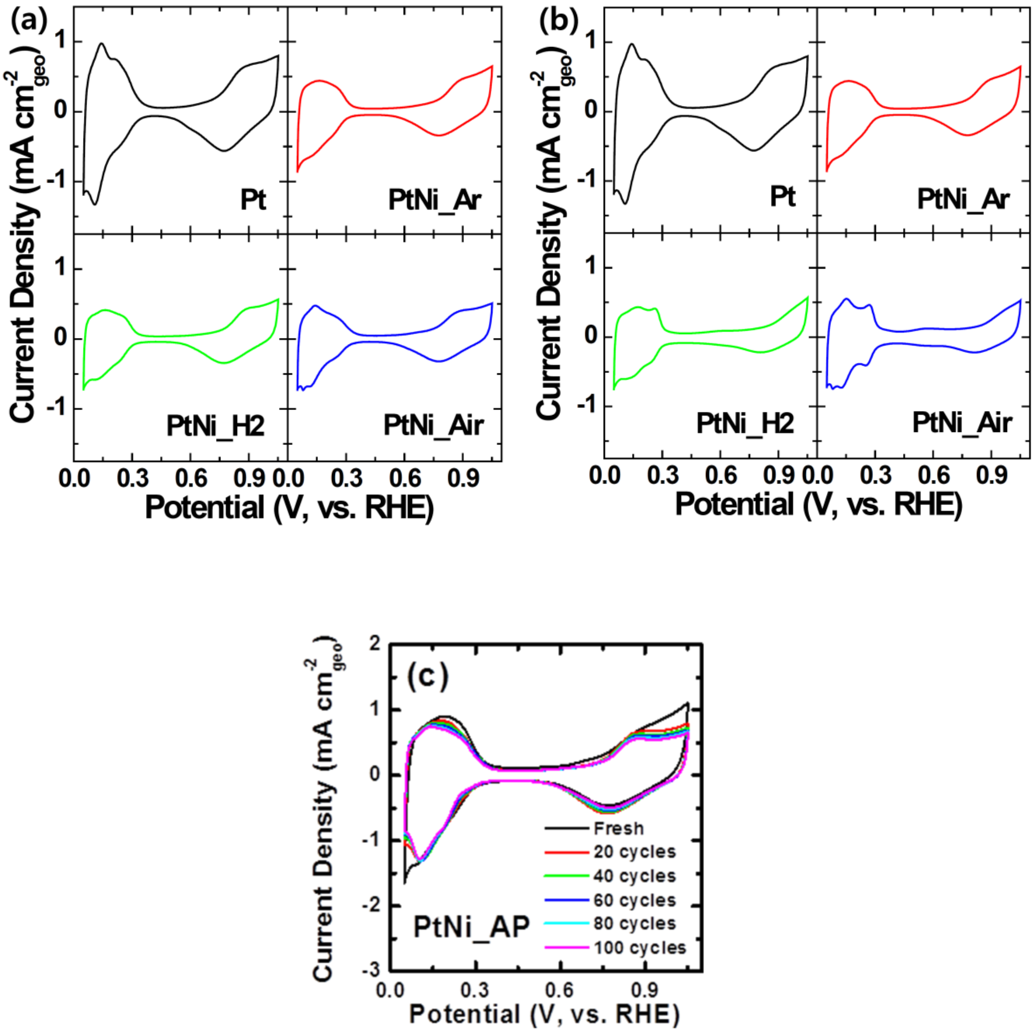

Fig. S1. Cyclic voltamograms (CVs) of Pt, PtNi_Ar, PtNi_H2, and PtNi_Air nanoparticles in (a) 0.1 M $HClO_4$ and (b) 0.1 M $HClO_4$ + 0.1 M H_3PO_4; and (c) CVs of PtNi_AP in 0.1 M $HClO_4$ after potential cycling. All measurements were carried out at 20 ^oC in saturated Ar condition (99.999%).

S1.2. Kinetic current density

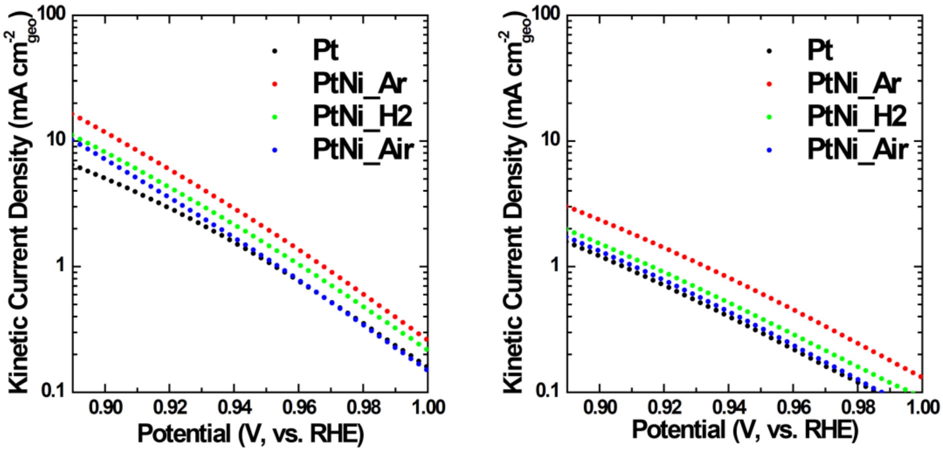

Fig. S2. Kinetic current density of Pt , PtNi_Ar, PtNi_H2, and PtNi_Air nanoparticles in 0.1 M $HClO_4$ (left) and 0.1 M $HClO_4$ + 0.1 M H_3PO_4.(Right)

S2. XPS Spectra of Pt 4*f* and Ni 2*p*

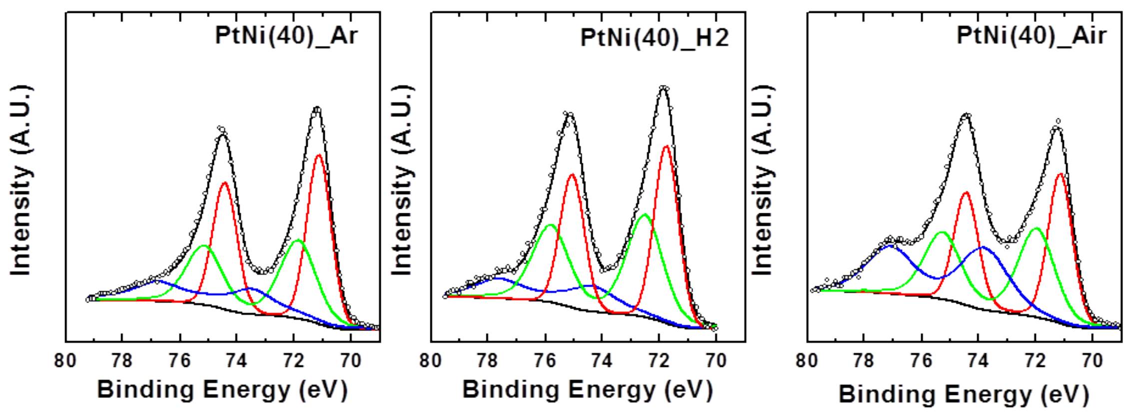

Fig. S3. XPS spectra of PtNi_Ar (left), PtNi_H2 (middle), and PtNi_Air (right) nanoparticles for Pt 4*f*.

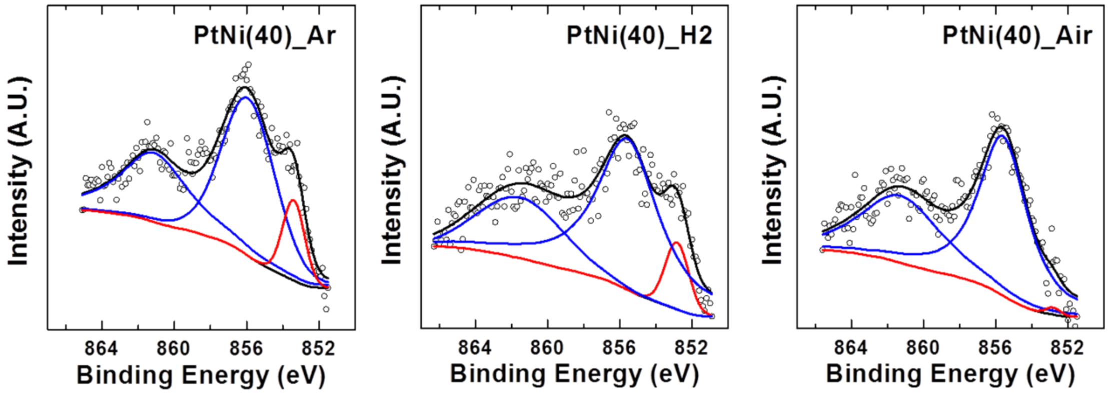

Fig. S4. XPS spectra of PtNi_Ar (left), PtNi_H2 (middle), and PtNi_Air (right) nanoparticles for Ni 2*p*.

Table S1. Deconvolution results from XPS spectra of Pt 4*f* and Ni 2*p*.

Area Ratio (%)	Pt 4f			Ni 2p		x^* (Pt_1Ni_x)
	Pt(0)	Pt(II)	Pt(IV)	Ni(0)	Ni(II)	
PtNi_Ar	52.4	33.4	14.2	10.0	90.0	0.44
PtNi_H2	56.6	23.9	19.5	11.6	88.4	0.45
PtNi_Air	33.0	36.1	30.9	0.6	99.4	0.50

S3. Supplementary Single-Cell Data

S3.1. Polarization curves of Pt and PtNi_Ar under air feed

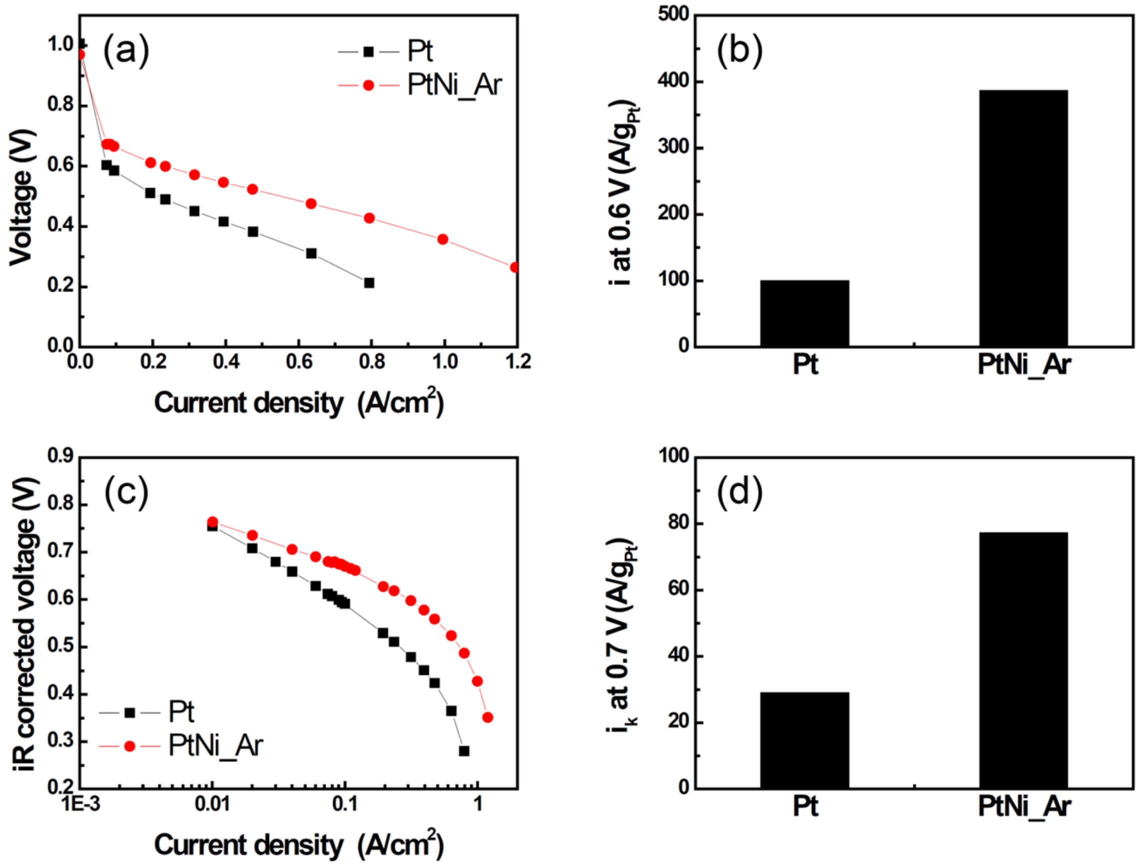

Fig. S5. (a) Polarization curve for Pt(HiSpec 4000, 40 wt%, 0.78 mg_{Pt} cm^{-2}) and PtNi_Ar(40 wt%, 0.6 mg_{Pt} cm^{-2}) as cathode catalysts (anode catalyst 1.0 mg_{Pt} cm^{-2}). The feed gas to cathode is non-humidified air (stoichiometry 2) and cell temperature is 160˚C. (b) Comparison of current density normalized with respect to platinum weight at 0.6V. (c) Tafel plot and (d) kinetic current density normalized with respect to platinum weight at 0.7 V

S3.2. Durability test of PtNi_Ar nanoparticles

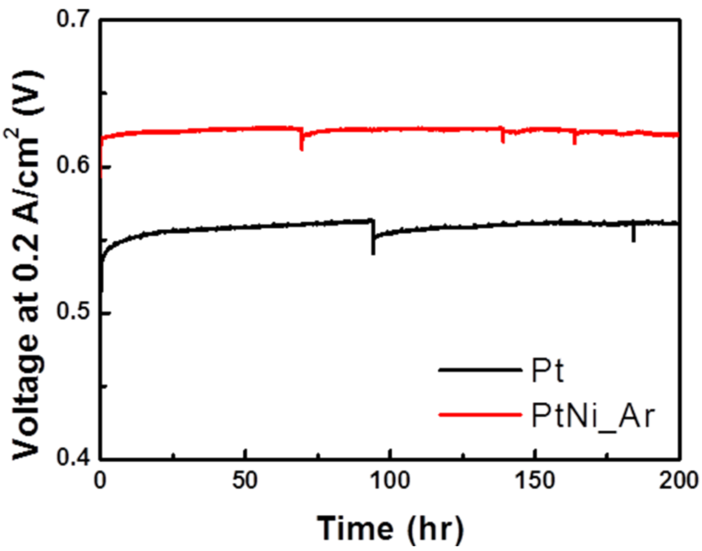

Fig. S6. Voltage at 0.2 A/cm^2 for Pt (40 wt.%, 0.78 mg$_{Pt}$ cm^{-2}) and PtNi_Ar (40 wt%, 0.6 mg$_{Pt}$ cm^{-2}) as cathode catalysts (anode catalyst 1.0 mg$_{Pt}$ cm^{-2}). The feed gas to cathode is non-humidified air(stoichiometry 2) and cell temperature is 160˚C.

S4. Supplementary TEM Images

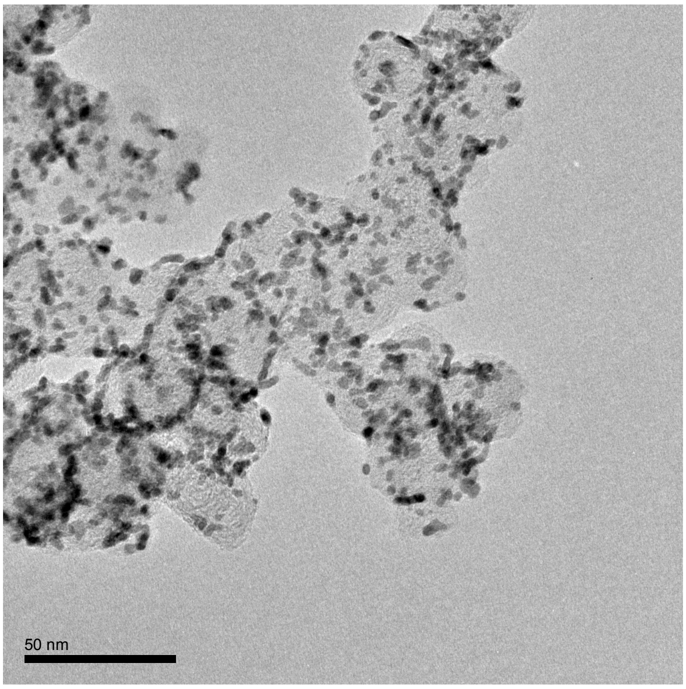

Fig. S7. TEM image of as-prepared Pt_1Ni_2 /C.

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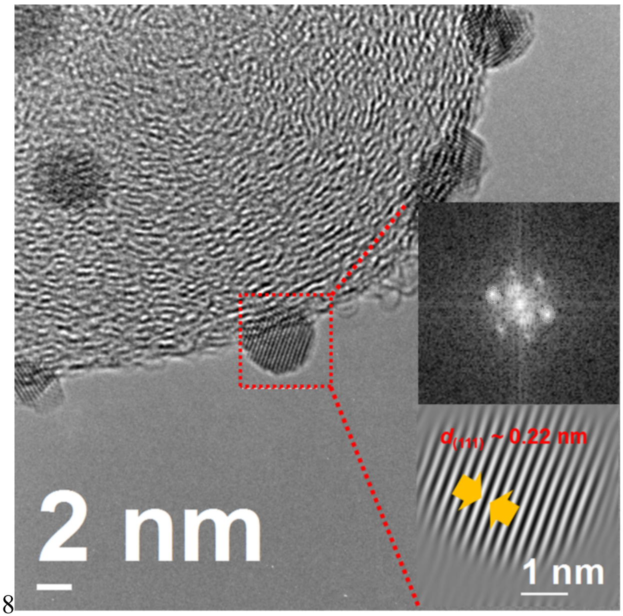

Fig. S8. High resolution-TEM image of the PtNi _Ar.

S5. UV-vis Spectra

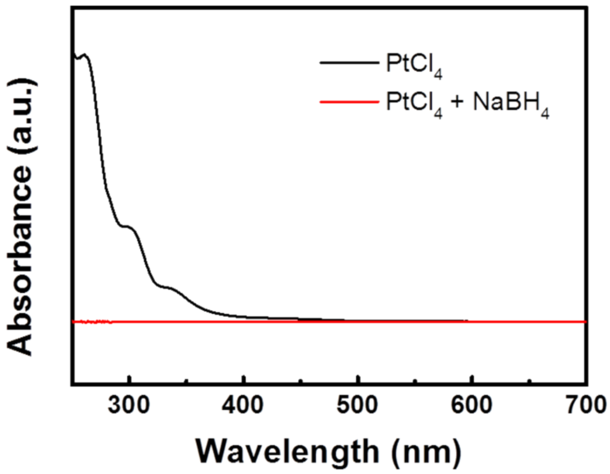

Fig S9. UV-vis spectra of $PtCl_4$ solution in the ethanol before (black)/after (red) the addition of the re ducing agent ($NaBH_4$).