

## Supporting Information

### Morphology Dependent Electrocatalytic Activity of Ir Nanostructures Towards Oxygen Reduction

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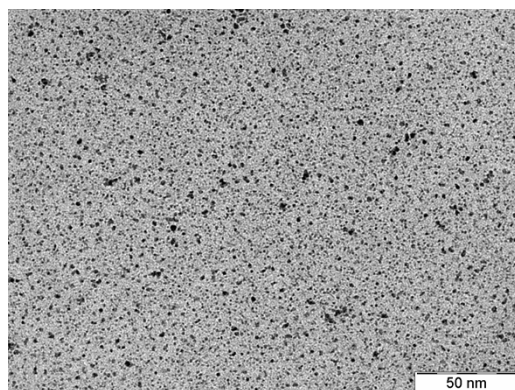


Figure S1: TEM image of Ir nanoparticles recorded at 5 minutes of the reaction. The Ir nanoparticles are prepared using aqueous  $\text{IrCl}_3$  in the presence of AA and sodium borohydride at  $80^\circ\text{C}$  for 5 minutes.

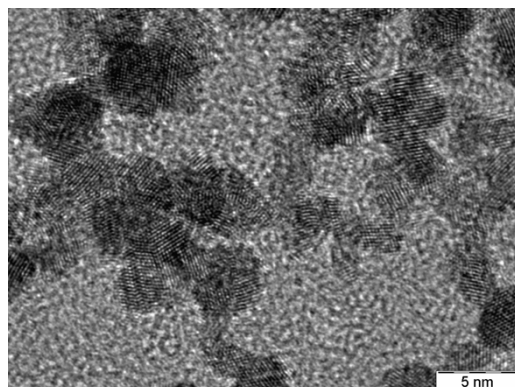


Figure S2: HRTEM images of Ir nanochains prepared using AA as the capping agent.

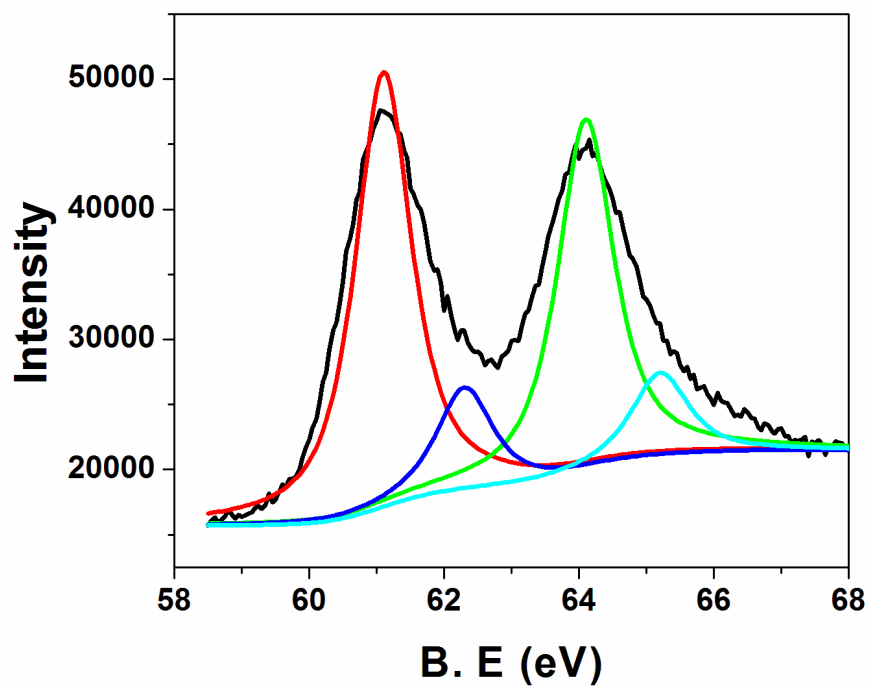


Figure S3: Deconvoluted XPS Ir-4f spectra of Ir nanochains. The peaks corresponding to 61.1 eV and 64.1 eV are for Ir (0) and 62.3 and 65.1 eV are for IrO<sub>2</sub> phase.

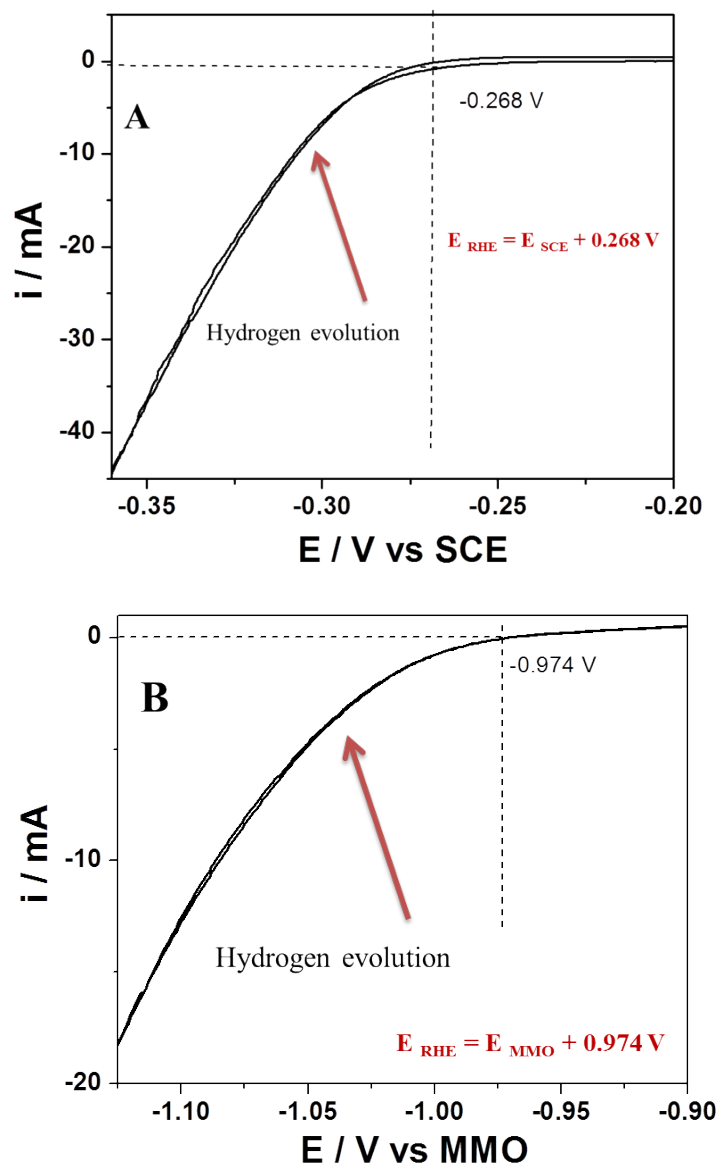


Figure S4. RHE calibration of (A) SCE under hydrogen saturated 0.5 M  $\text{H}_2\text{SO}_4$  and (B) MMO under hydrogen saturated 0.1 M  $\text{KOH}$  solutions. The voltammograms is carried out at a scan rate of 1 mV/s.

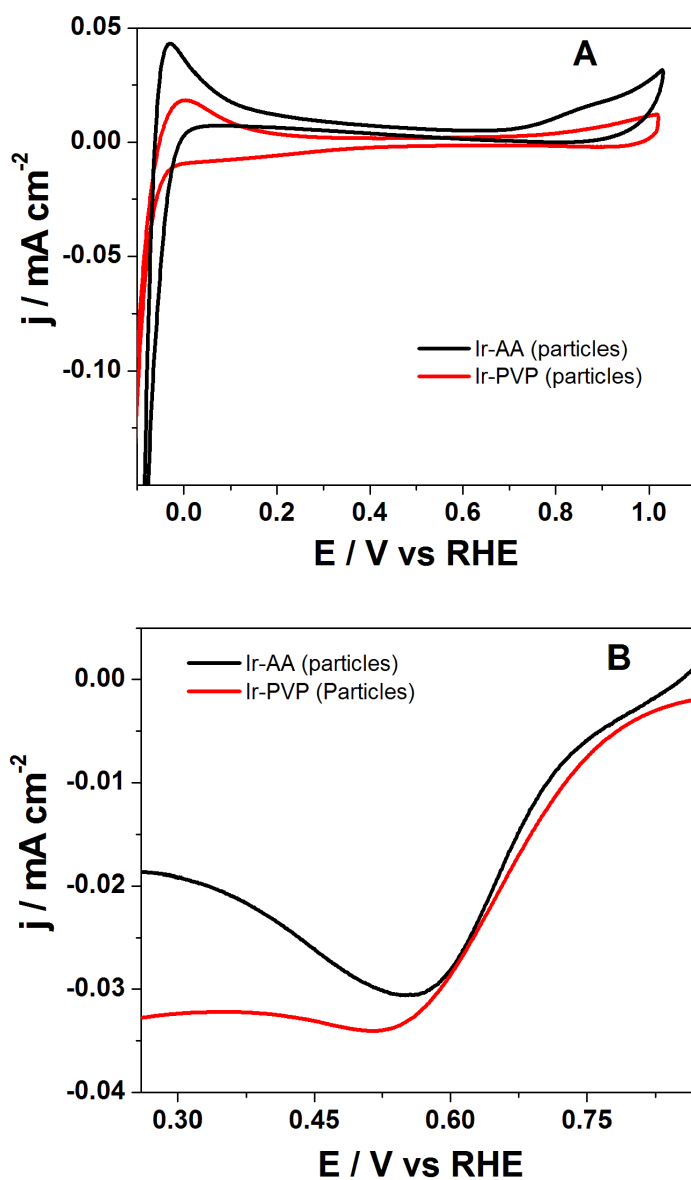


Figure S5. (A) Cyclic voltammograms of Ir nanoparticles (AA and PVP capped) in N<sub>2</sub> saturated 0.5 M H<sub>2</sub>SO<sub>4</sub> at a scan rate of 0.05 V/s and (B) Linear sweep voltammograms in O<sub>2</sub> saturated 0.5 M H<sub>2</sub>SO<sub>4</sub> solution at a scan rate of 0.005 V/s. Loading of Ir used is 210  $\mu\text{g}/\text{cm}^2$  on a GCE.

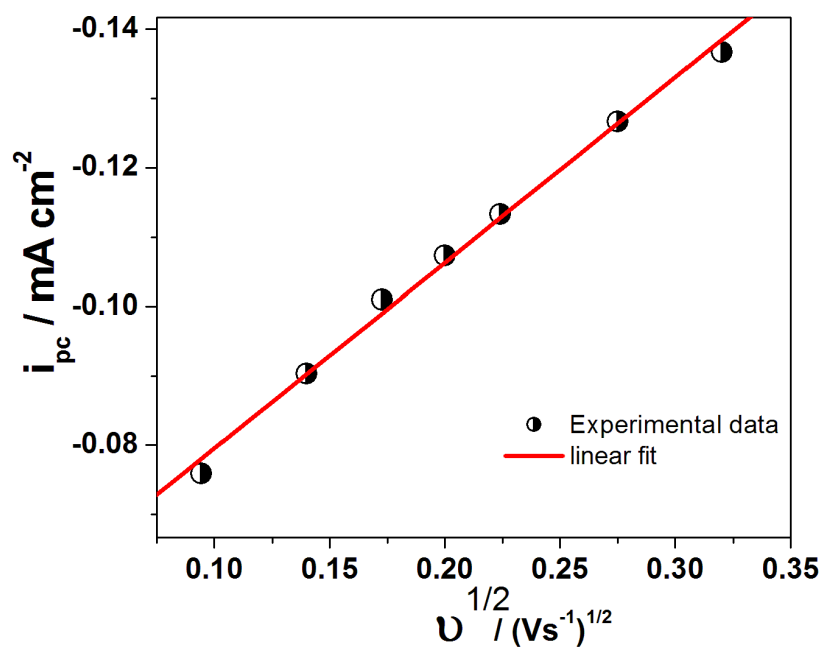


Figure S6: Variation of cathodic peak currents as the function of square root of scan rate on Ir nanochains. Supporting electrolyte used is 0.5 M  $\text{H}_2\text{SO}_4$ .

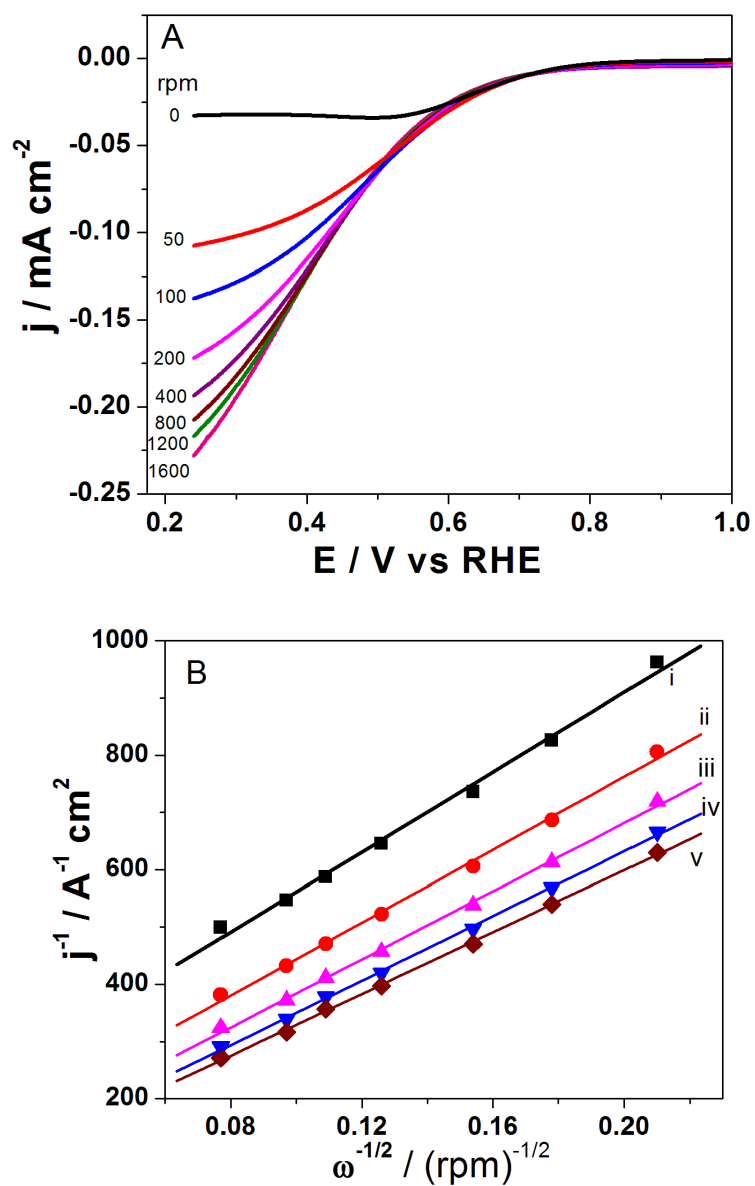


Figure S7: (A) Linear sweep voltammograms showing the effect of rotation rate on Ir nanoparticles. The potential scan rate is 0.005 V/s and the electrolyte used is  $\text{O}_2$  saturated 0.5 M  $\text{H}_2\text{SO}_4$ . (B) Koutecky-Levich plots for ORR on Ir nanoparticles at different applied DC potentials (i) 0.5 V; (ii) 0.45 V; (iii) 0.4 V; (iv) 0.35 V and (v) 0.25 V.

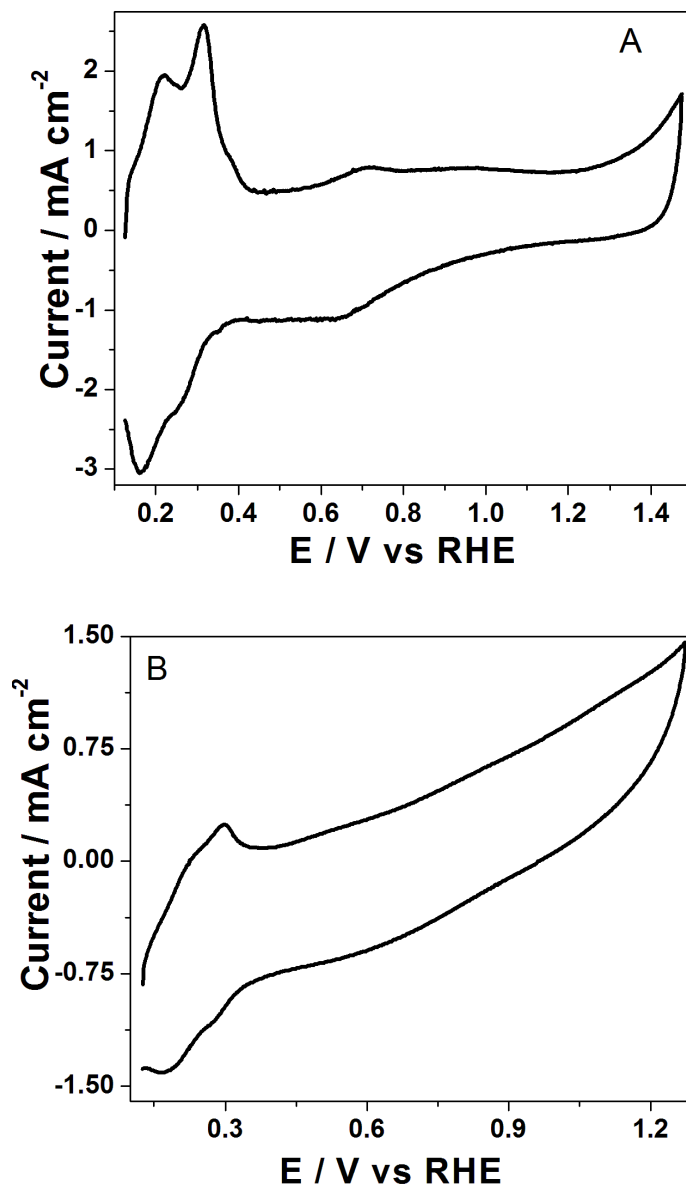


Figure S8: Cyclic voltammograms of (A) Ir nanochains and (B) Ir nanoparticles in N<sub>2</sub> saturated 0.1 M KOH solution at a scan rate of 50 mV/s. Loading of Ir used is 120 μg/cm<sup>2</sup>.



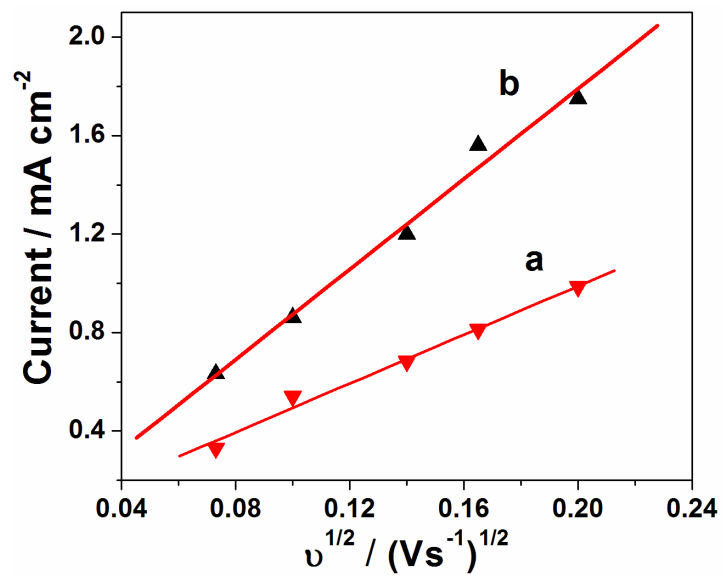


Figure S9: Variation of peak current with square root of scan rate for ORR on (a) Ir nanoparticles and (b) Ir nanochains. Supporting electrolyte used is 0.1 M KOH.

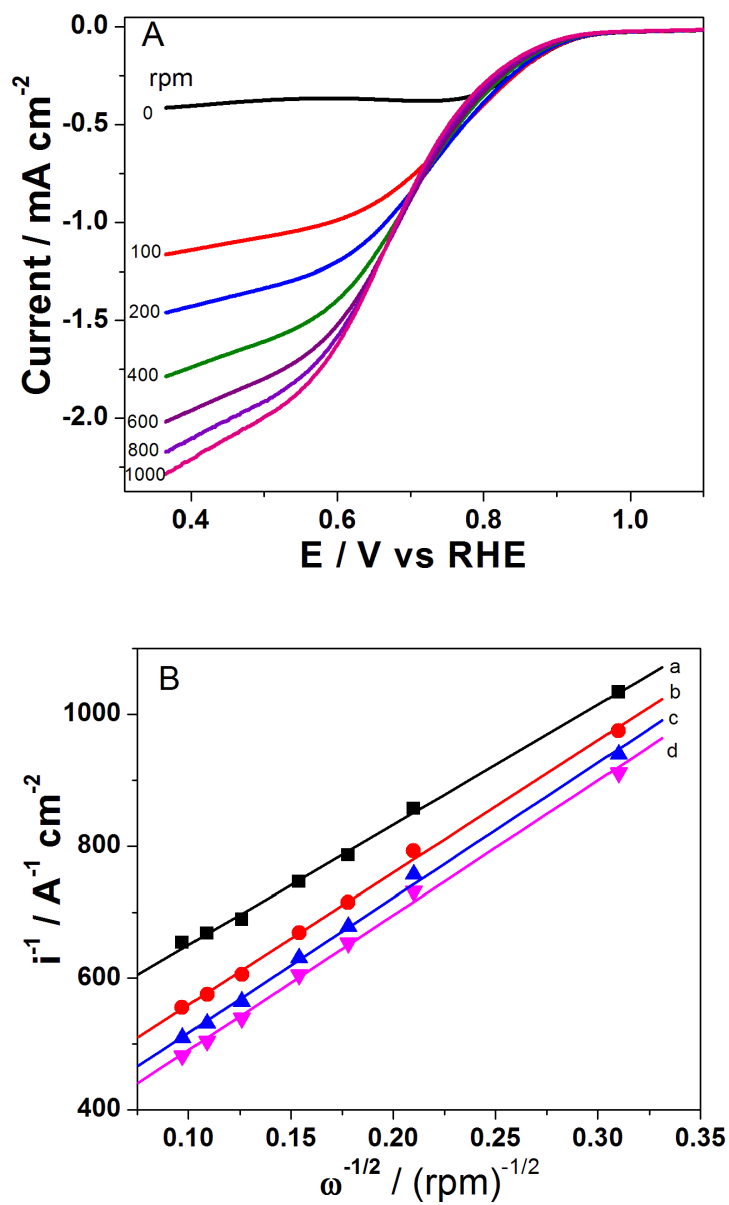


Figure S10: (A) Linear sweep voltammograms as a function of rotation rate in 0.1 M KOH solution on Ir nanoparticles; (B) corresponding K-L plots for ORR at different potentials (a) 0.65 V; (b) 0.6V; (c) 0.55 V and (d) 0.5 V vs. RHE.

Table S1: Kinetic parameters (n, k) for ORR in alkaline media on Ir nanoparticles and Ir nanochains.

E vs. RHE	Ir nanoparticles		Ir nanochains	
	n	k (cm/s)	n	k (cm/s)
0.75 V	3.6	0.0083	3.8	0.011
0.7 V	3.6	0.012	3.7	0.017
0.6 V	3.8	0.016	3.9	0.023
0.5 V	3.8	0.021	3.9	0.029

Table S2: Tafel slopes for ORR on Ir nanoparticles and Ir nanochains in 0.1 M KOH at a rotation speed of 1000 rpm.

Catalyst	Tafel slope (mV/ dec) Region-I	Tafel slope (mV/ dec) Region-II	References
Ir nanoparticles	-83	-163	Present study
Ir nanochains	-76	-149	-do-
Pt	-67	-121	31
Pd	-69	-127	37,43