Supporting Information

Versatile Bifunctional and Supported IrNi Oxide Catalyst for Photoelectrochemical Water Splitting

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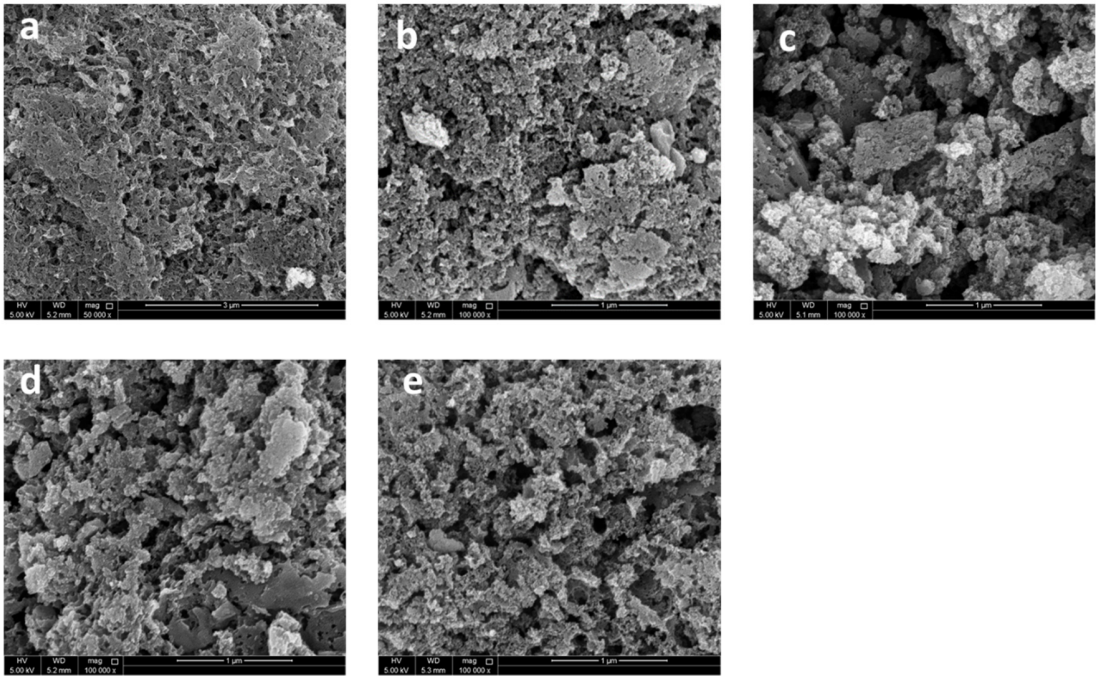

Figure S1. SEM images of (a) Ni@AC, (b) 1Ir4Ni@AC, (c) 1Ir1Ni@AC, (d) 4Ir1Ni@AC and (e) Ir@AC, scaler bar in the images refer to 1 μm.

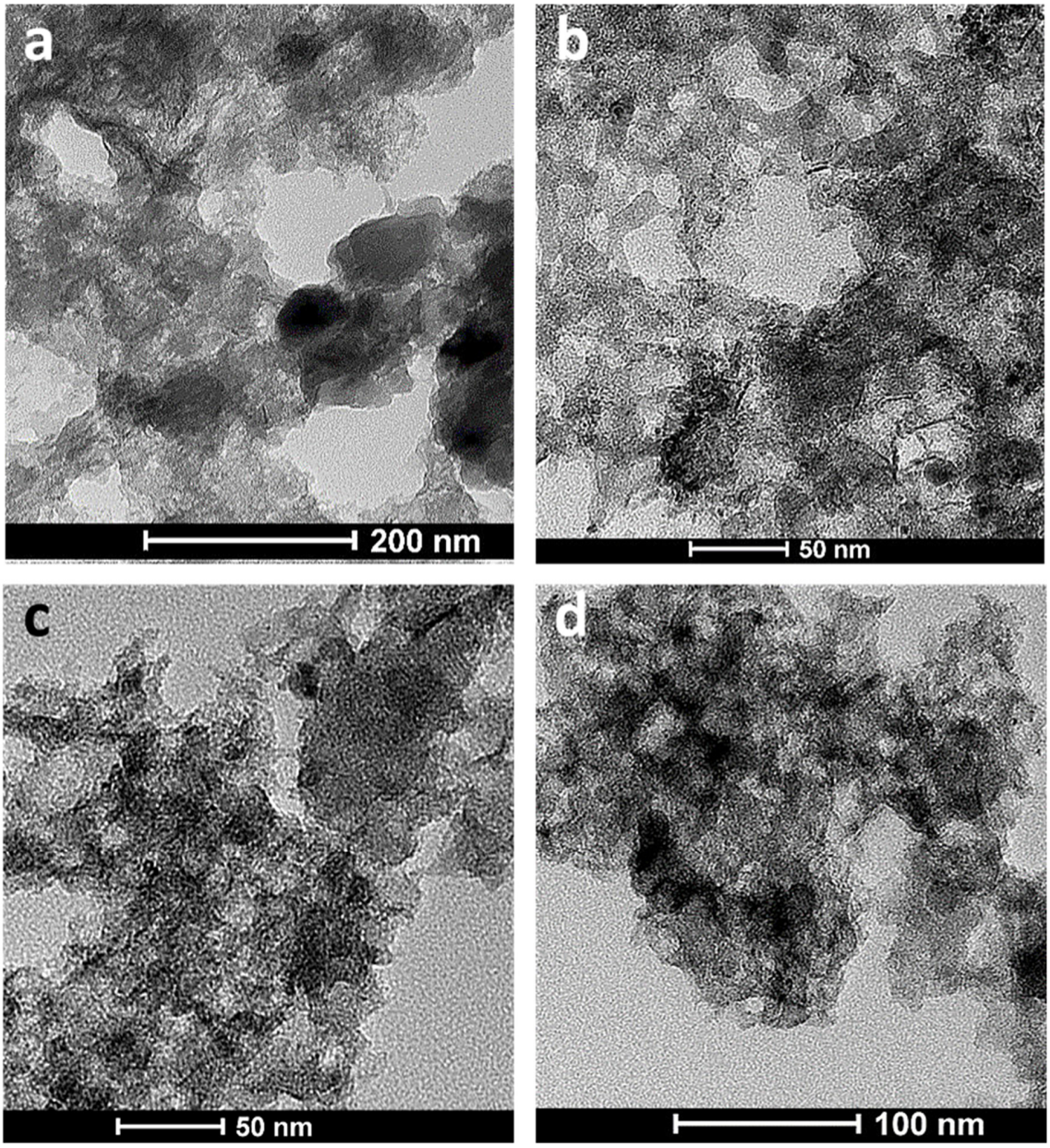

Figure S2. TEM images of (a) Ni@AC, (b) 1Ir4Ni@AC, (c) 1Ir1Ni@AC, and (d) Ir@AC, scaler bar is given in each image.

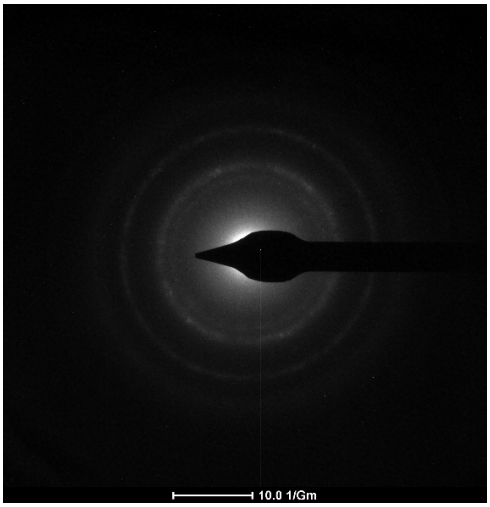

Figure S3. SAED ring pattern of Ni@AC

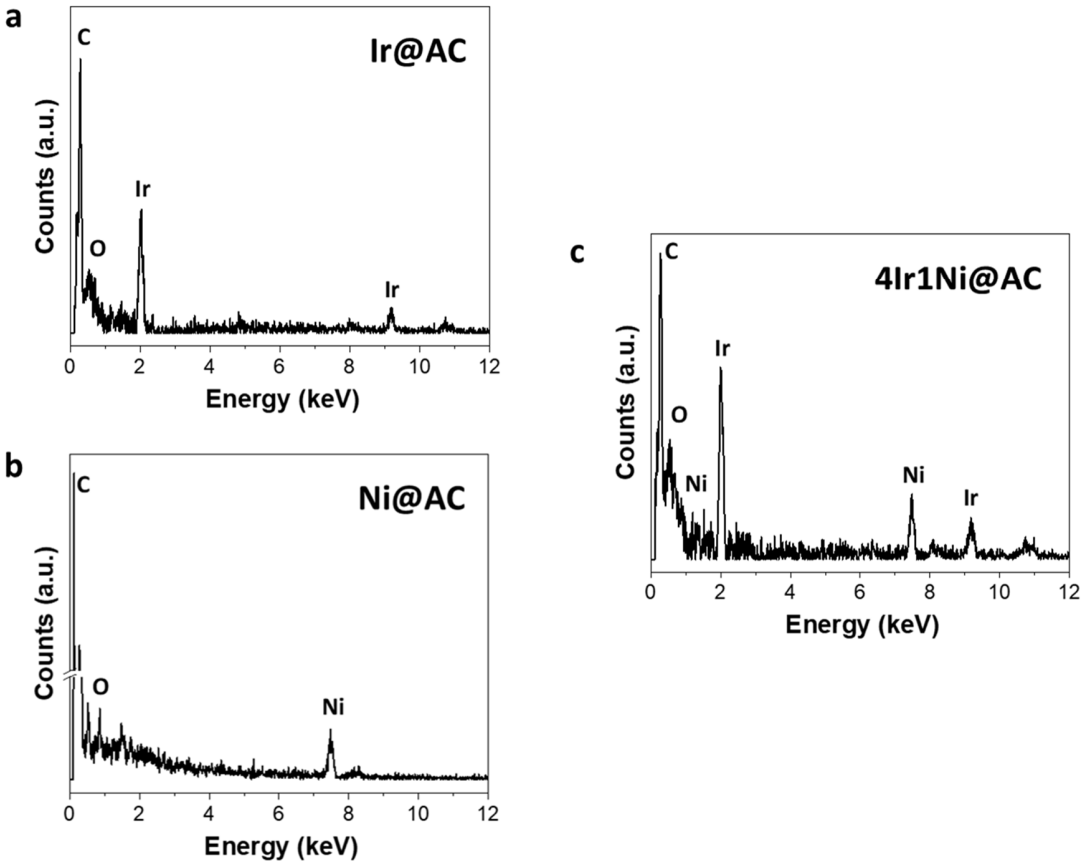

Figure S4. SEM-EDX spectra of (a) Ir@AC (b) Ni@AC and (c) 4Ir1Ni@AC showing the elements present in each catalyst material.

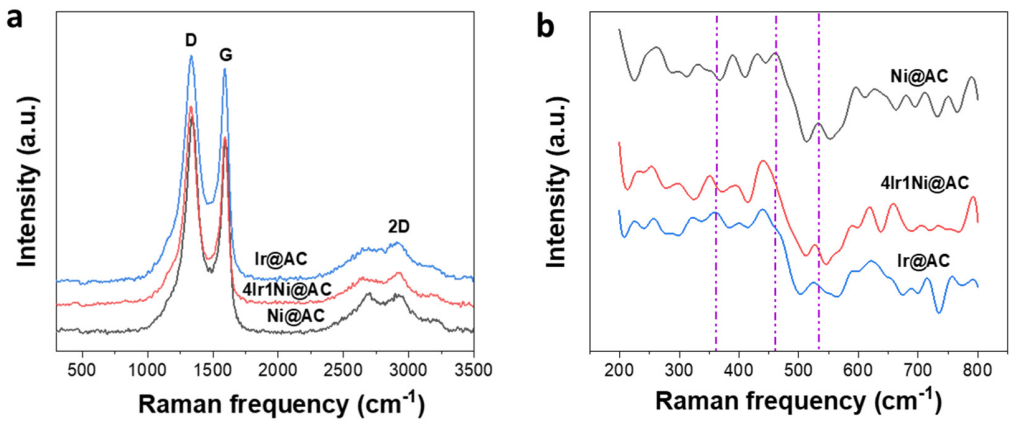

Figure S5. Raman spectra of Ir@AC, Ni@AC and 4Ir1Ni@AC (a) 300 3500 cm^{-1} and (b) 200-800 cm^{-1} frequency range

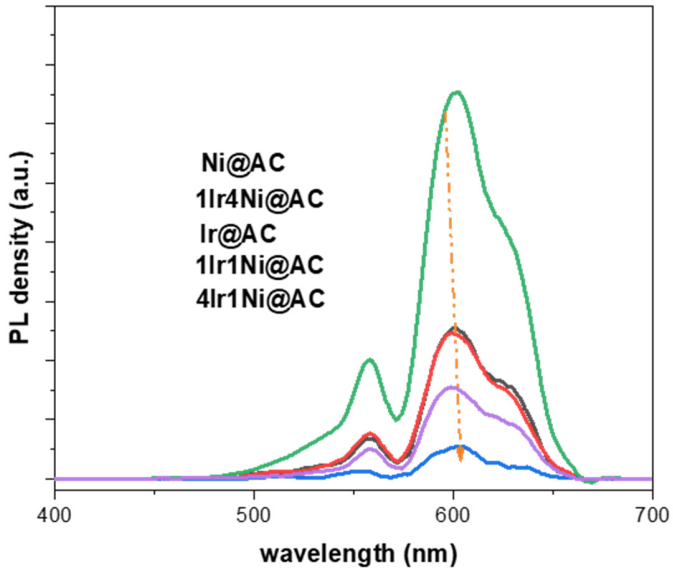

Figure S6. PL emission spectra of metal and alloy nanoparticles of Ir and Ni, after excitation at 350 nm.

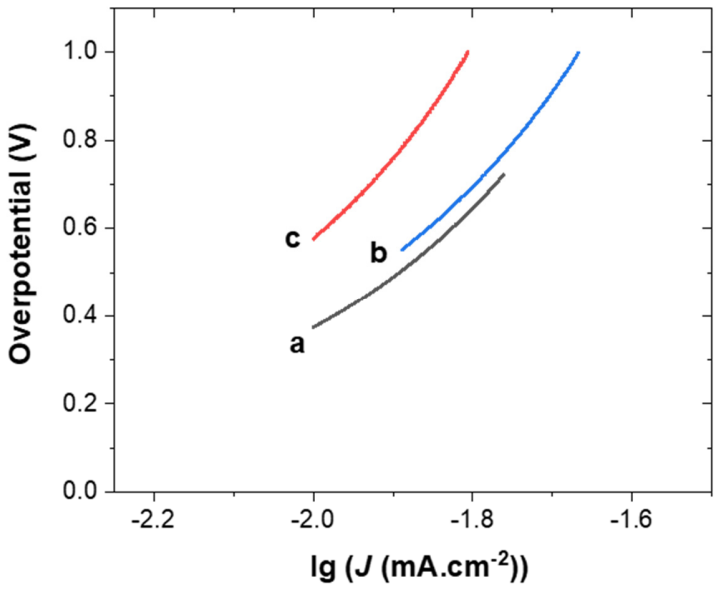

Figure S7. Tafel slope for HER reaction under 1.5 G AM light illumination in a. NaOH, b. Na_2SO_4 and c. H_2SO_4 electrolyte solutions.

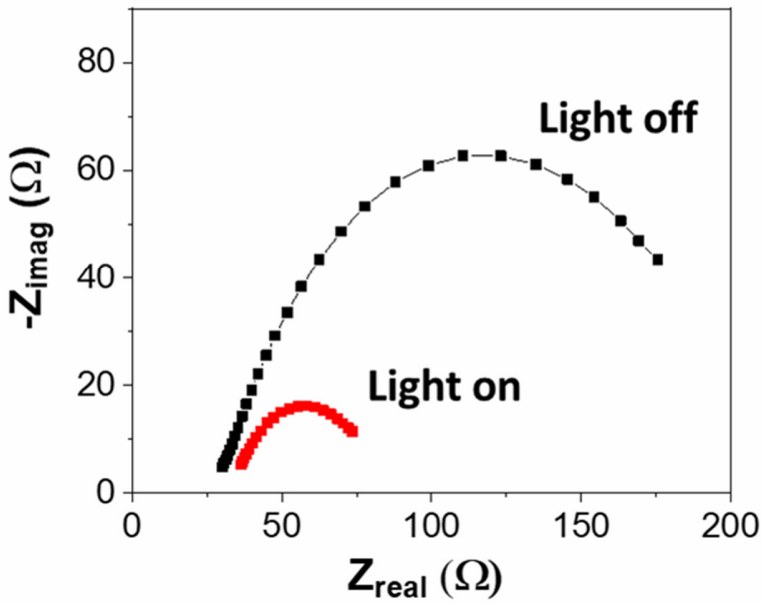

Figure S8. EIS spectra of 4Ir1Ni@AC electrode in 0.1 M Na_2SO_4 electrolyte measured from 10 mHz to 100 kHz frequency range at 5 mV AC amplitude.

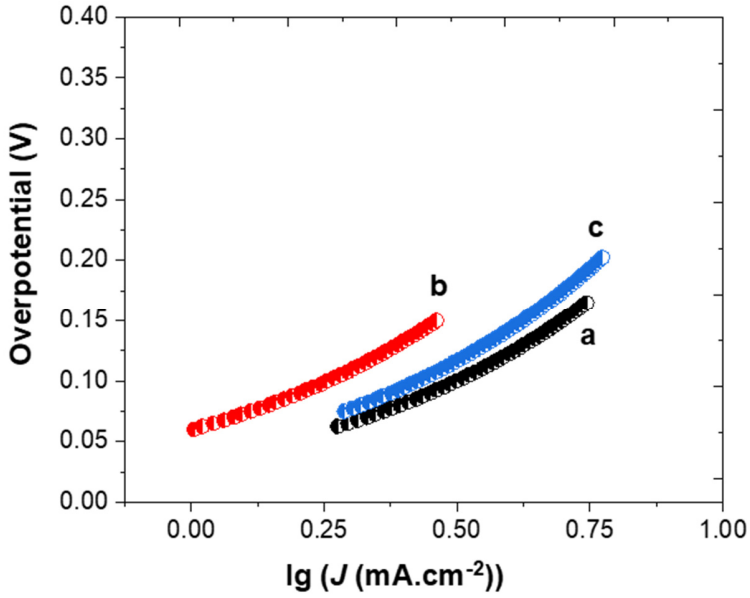

Figure S9. Tafel slope for OER reaction under 1.5 G AM light illumination in a. NaOH, b. Na_2SO_4 and c. H_2SO_4 electrolyte solutions.

Table S1. Relative mass ration between Ir and Ni

alloy code	Ir: Ni weight ratio
1ir1Ni@AC	**1.2±0.1:**1
1Ir4Ni@AC	1**:3.5±0.2**
4Ir1Ni@AC	**4.2±0.1:**1

Table S2. Summary of recently reported Ir based electrocatalysts for water splitting performance

Reaction	Catalyst	Electrolyte	Overpotential at 10 mA cm^{-2}/ mV	Ref
HER	$Er_2Si_2O_7$:IrO_2	1.0 M KOH	170	*ACS Catal.* **2018**, 8, 8830.
	Ir–Ni thin films	1.0 M KOH	60	*Energy Technol.* **2019**, 2, 442.
	Ir NPs	1.0 M KOH	109	*J. Am. Chem. Soc.* **2015**, 137, 4347.
	4Ir1Ni@AC	0.1 M NaOH	430	This work
OER	Ir	1.0 M KOH	430	*J. Am. Chem. Soc.* **2015**, 137, 4347.
	IrO_x	1.0 M NaOH	320	*J. Am. Chem. Soc.* **2013**, 135, 16977.
	Mesoporous IrO_x	0.1 M NaOH	320	*J. Phys. Chem. C* **2009**, 113, 12958.
	IrNi oxide	0.1 M HClO4	310	*J. Am. Chem. Soc.* **2015**, 137, 13031.
	4Ir1Ni@AC	0.1 M NaOH	250	This work