

Electronic Supporting Information

Pencil Graphite Rods Decorated with Nickel and Nickel-Iron as Low-Cost Oxygen Evolution Reaction Electrodes

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Table 1. ECSA and overpotential referred to RHE data for the different samples studied. In brackets the value of the interfacial overpotential, i.e. after subtracting the potential drop at series resistance

Electrode	$C_{dl}@-0.05V$ (mF·cm ⁻²)	ECSA	R_s (Ω)	η ($\eta - IR_s$) @10 mA·cm ⁻² (mV)	η ($\eta - IR_s$) @100 mA·cm ⁻² (mV)
ED@Ni/PGR	134	768	1.8	290 (270)	380 (325)
FA@Ni/PGR	191	1093	2.5	252 (240)	440 (300)
FA@NiFe/PGR	186	1071	2.5	250 (240)	450 (290)
FA@PGR	182	1042	1.9	400 (370)	620 (500)
Glassy Carbon	0.174	1	-	-	-

SEM and EDX analysis

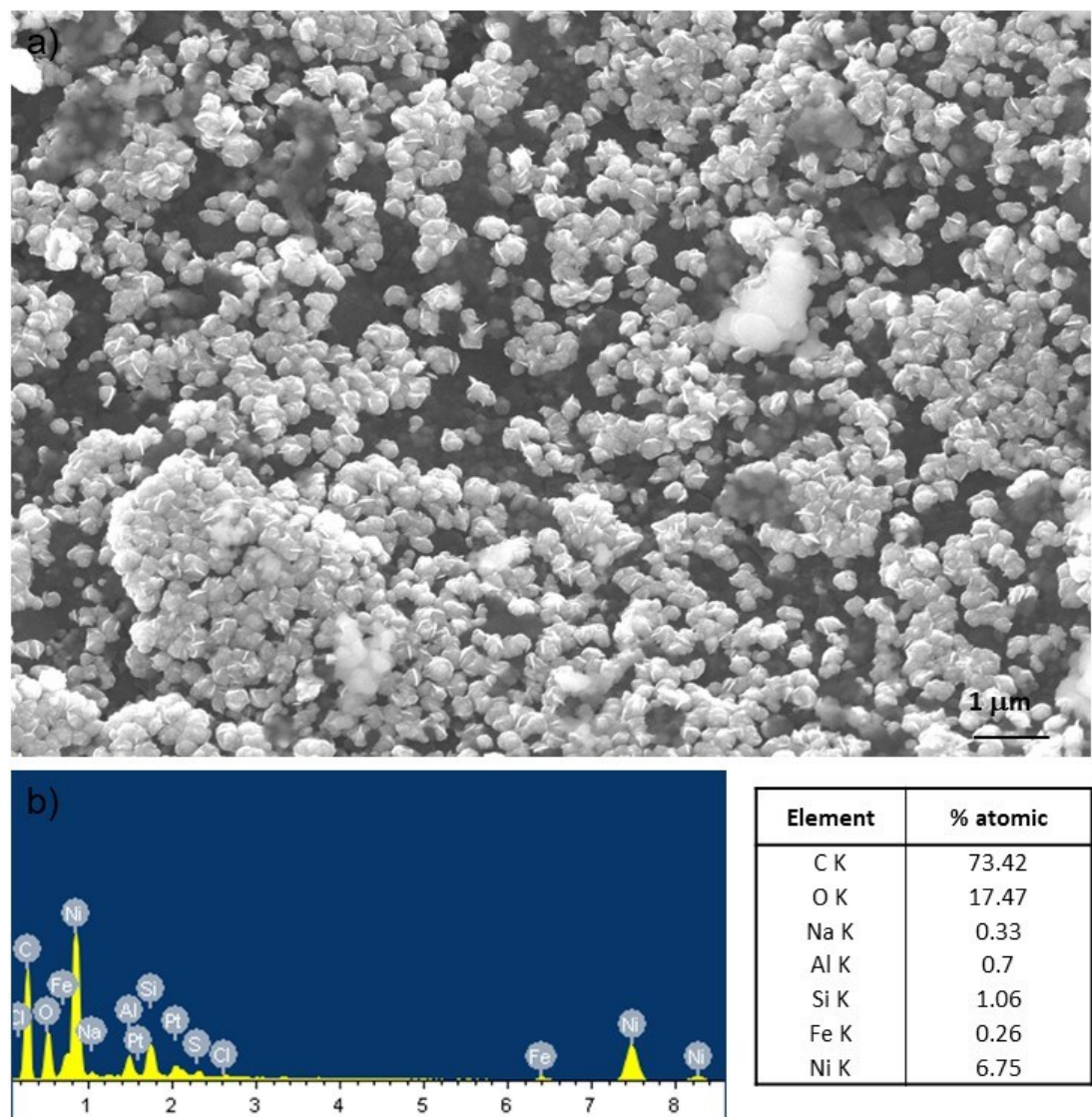


Figure S1. a) SEM and b) EDX analysis of ED@Ni/PGR

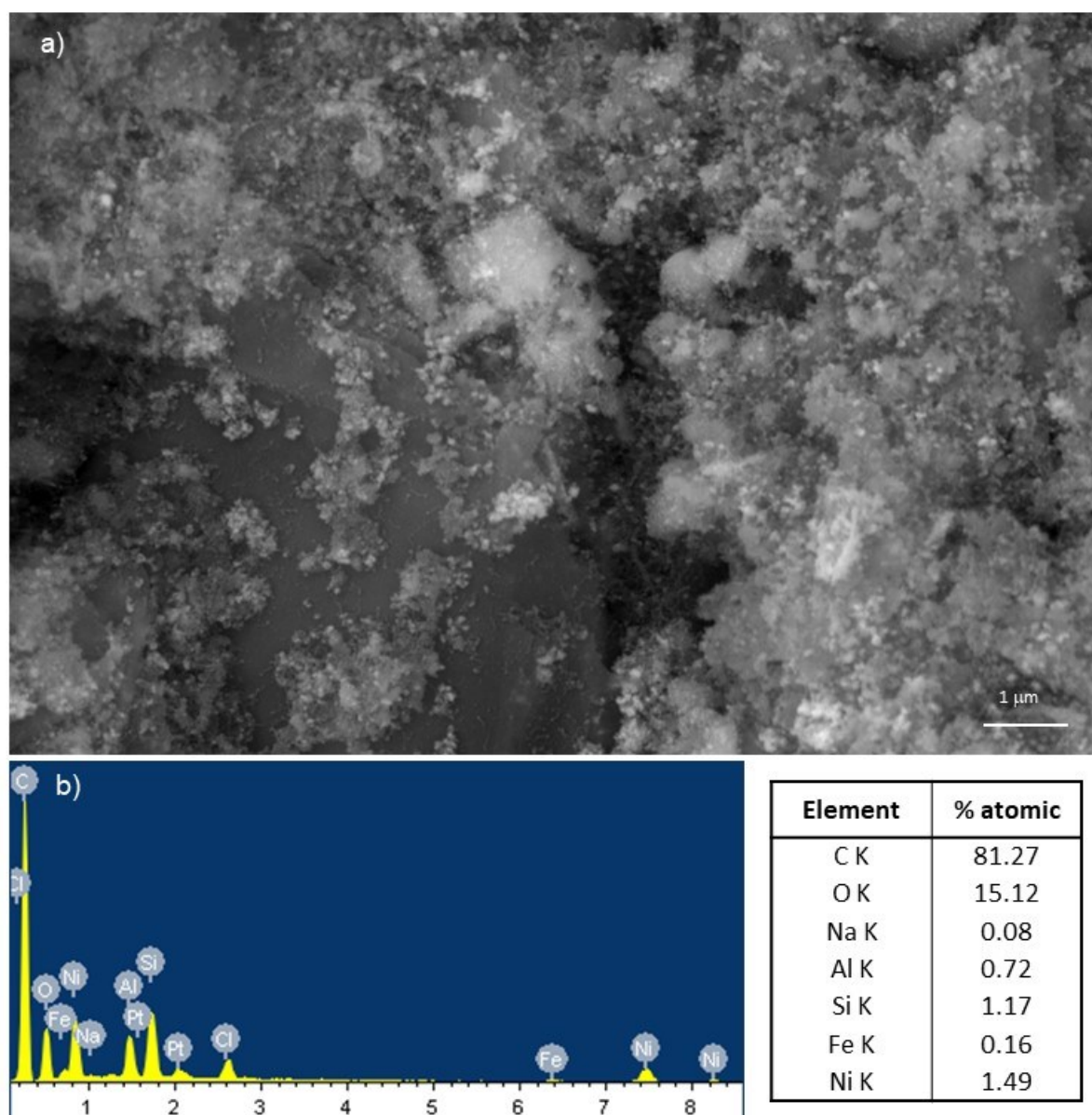


Figure S2. a) SEM and b) EDX analysis of FA@Ni/PGR

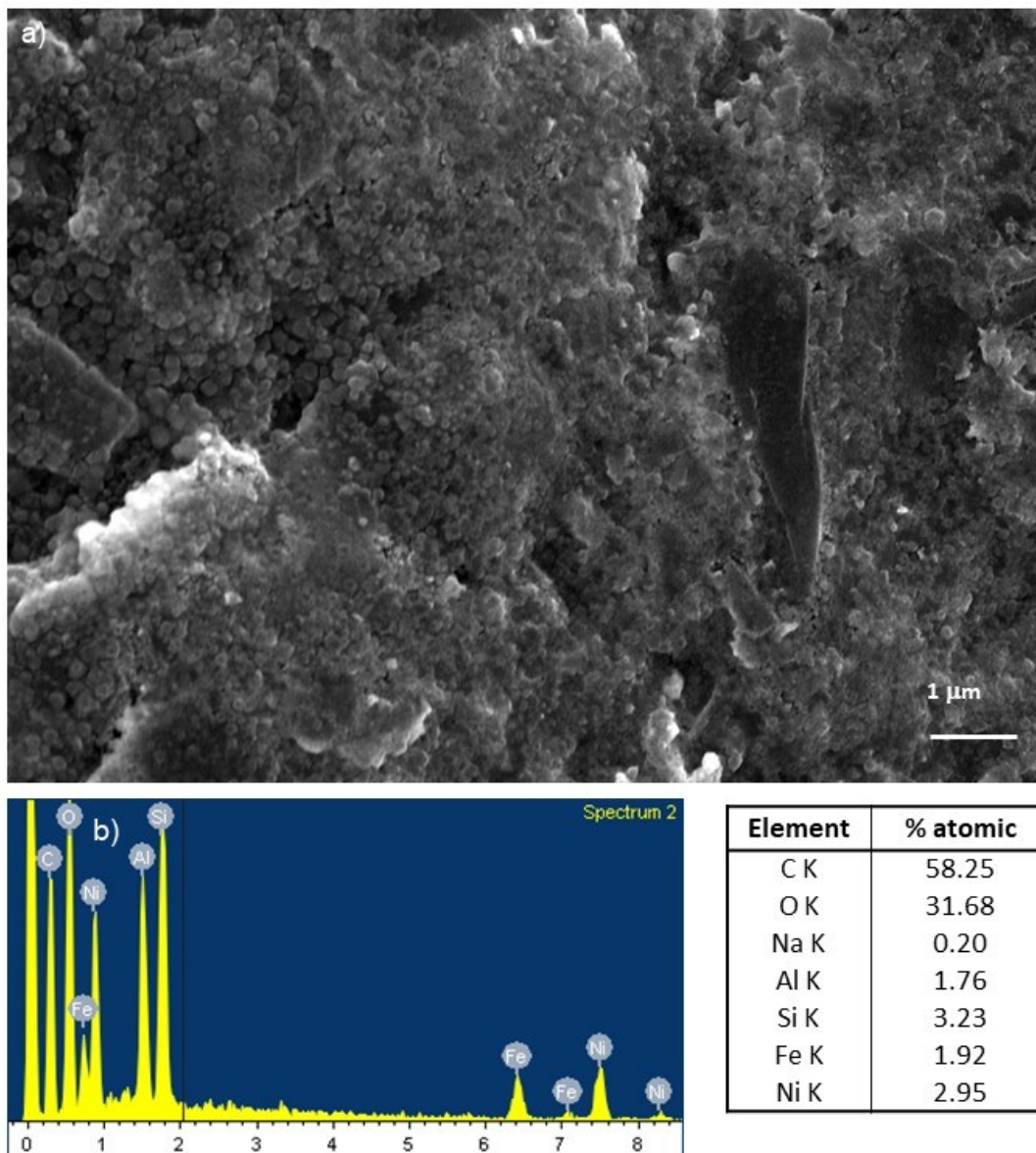


Figure S3. a) SEM and b) EDX analysis of FA@NiFe/PGR

XPS

Table S2. Quantification of Ni and Fe species in each sample

a)				b)		
Sample	Ni ⁰	Ni ²⁺	Ni ³⁺	Sample	Fe ²⁺	Fe ³⁺
ED@Ni/PGR	14.6	66.1	19.2	FA@PGR	88.7	11.3
FA@Ni/PGR	-	65.9	34.1	FA@NiFe/PGR	70.3	29.7
FA@NiFe/PGR	-	65.7	34.3			

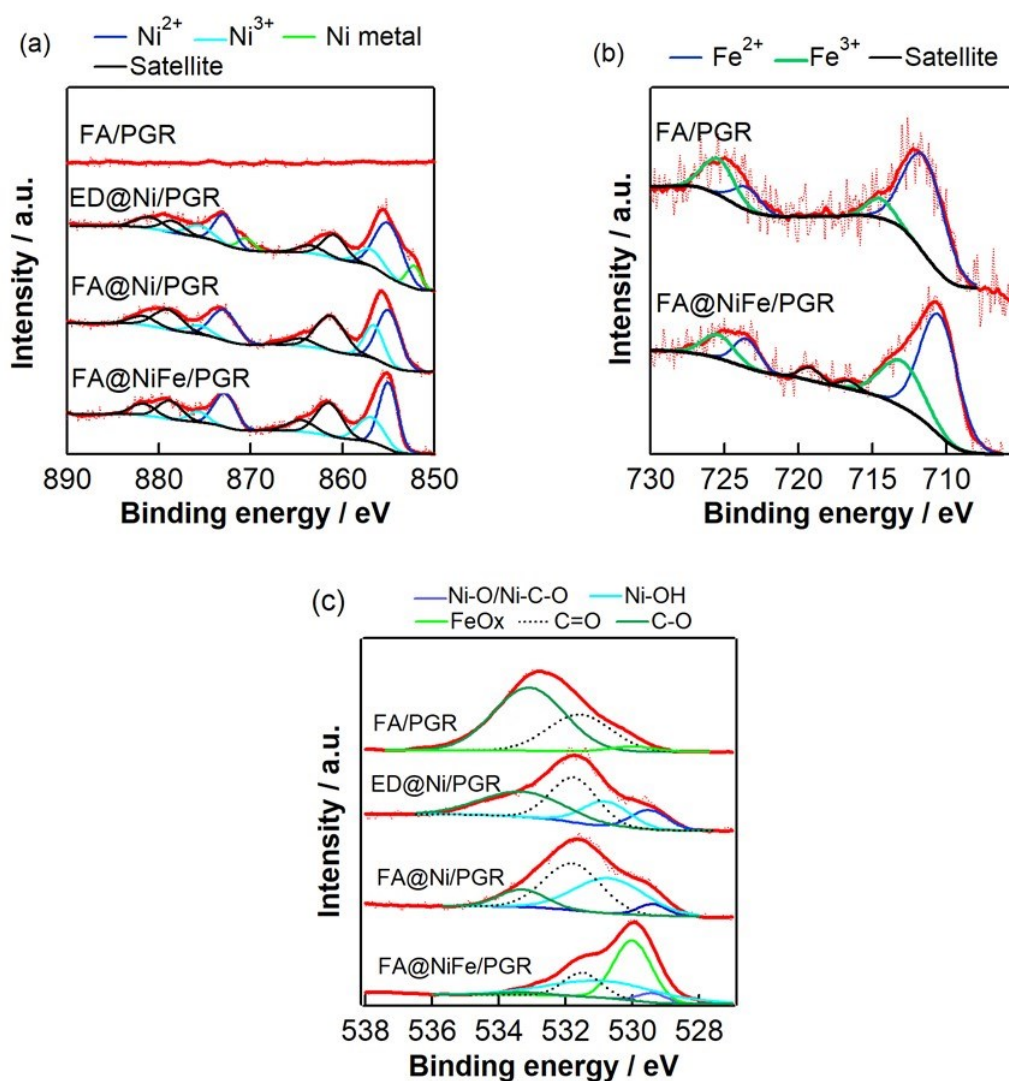


Figure S4. XPS spectra of (a)Ni2p and (b)O1s in FA@NiFe/PGR, ED@Ni/PGR and FA/PGR electrodes.

The dotted line is the measurement data, and the solid line is the smoothed data and fitting data.

Cyclic voltammetry measurements at different pH

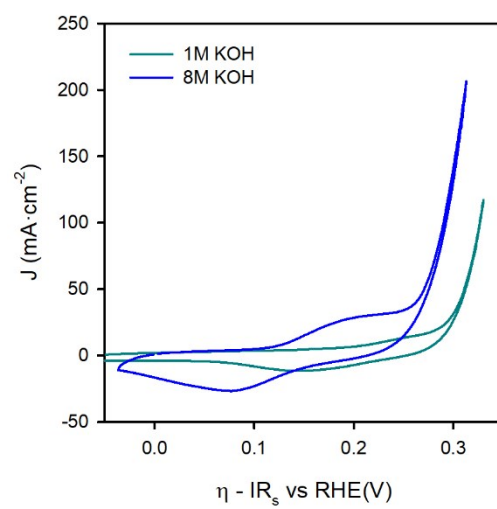


Figure S5. FA@NiFe/PGR measured at 1M and 8M KOH

Impedance parameters at the applied overpotential

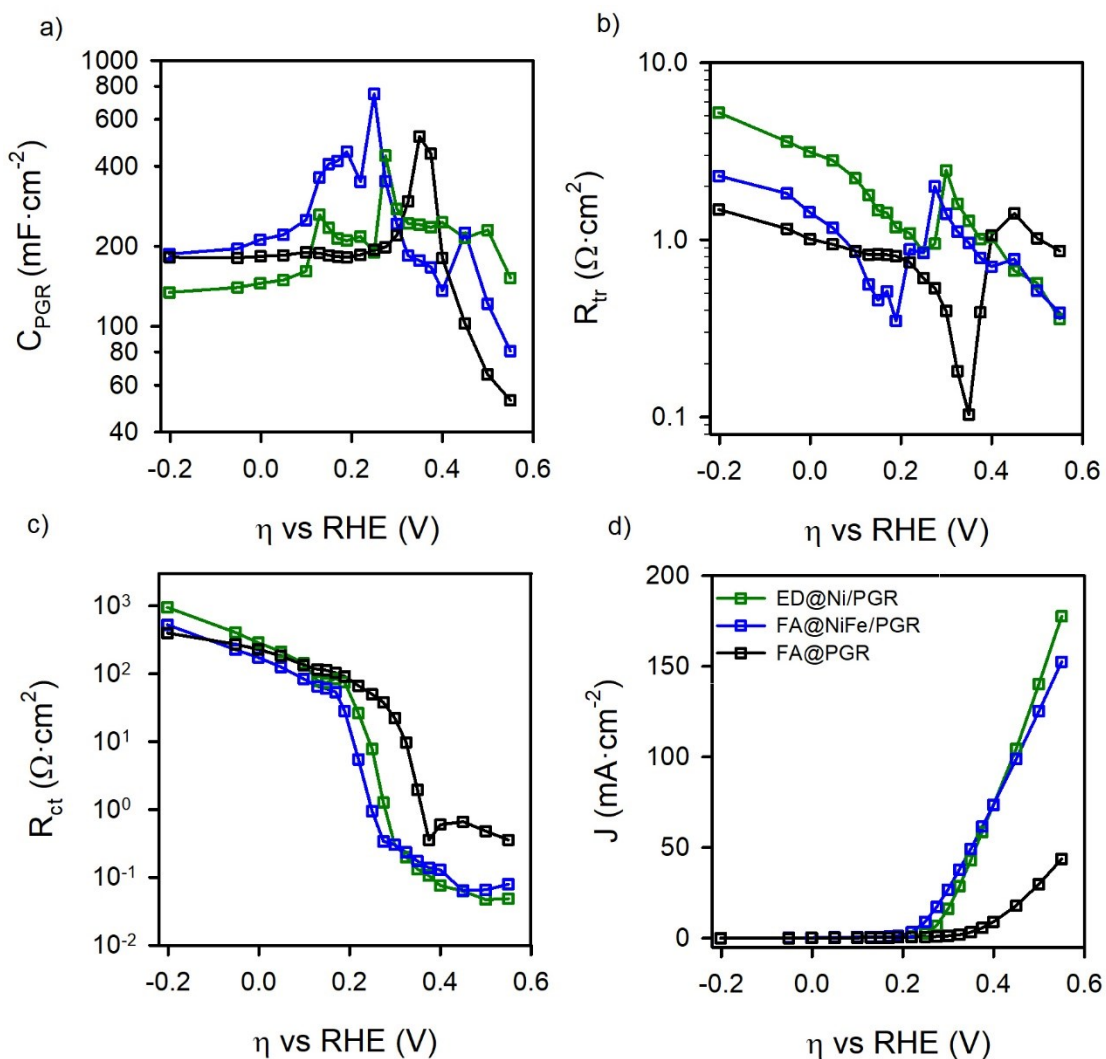


Figure S6. Results from the IS measurements data as a function of the overpotential for FA@PGR (Black), ED@Ni/PGR (Green), and FA@NiFe/PGR (Blue). (a) Electrode capacitance, (b) transport resistance, (c) Charge transfer resistance, and (d) J - V curve obtained during IS measurements

Comparison of impedance parameters with Fe decorated PGR

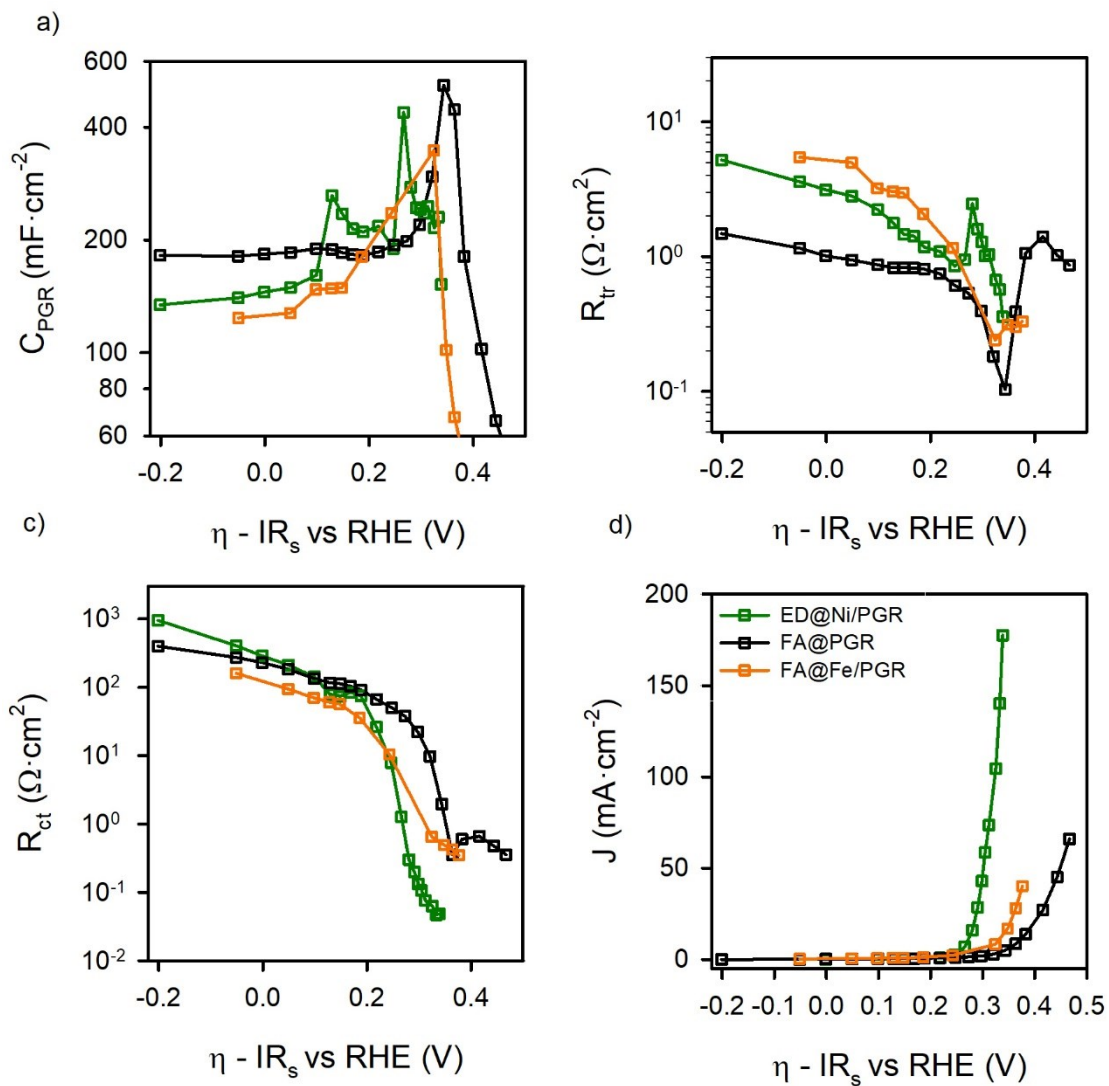


Figure S7. IS measurements as a function of the interfacial overpotential for FA@PGR (Black), ED@Ni/PGR (Green), and FA@Fe/PGR (Orange). (a) Electrode capacitance, (b) transport resistance, (c) Charge transfer resistance, and (d) J - V curve obtained during IS measurements