Supporting Information

Degradation Analysis of Triple Cation Perovskite

Solar Cells by Electrochemical Impedance Spectroscopy

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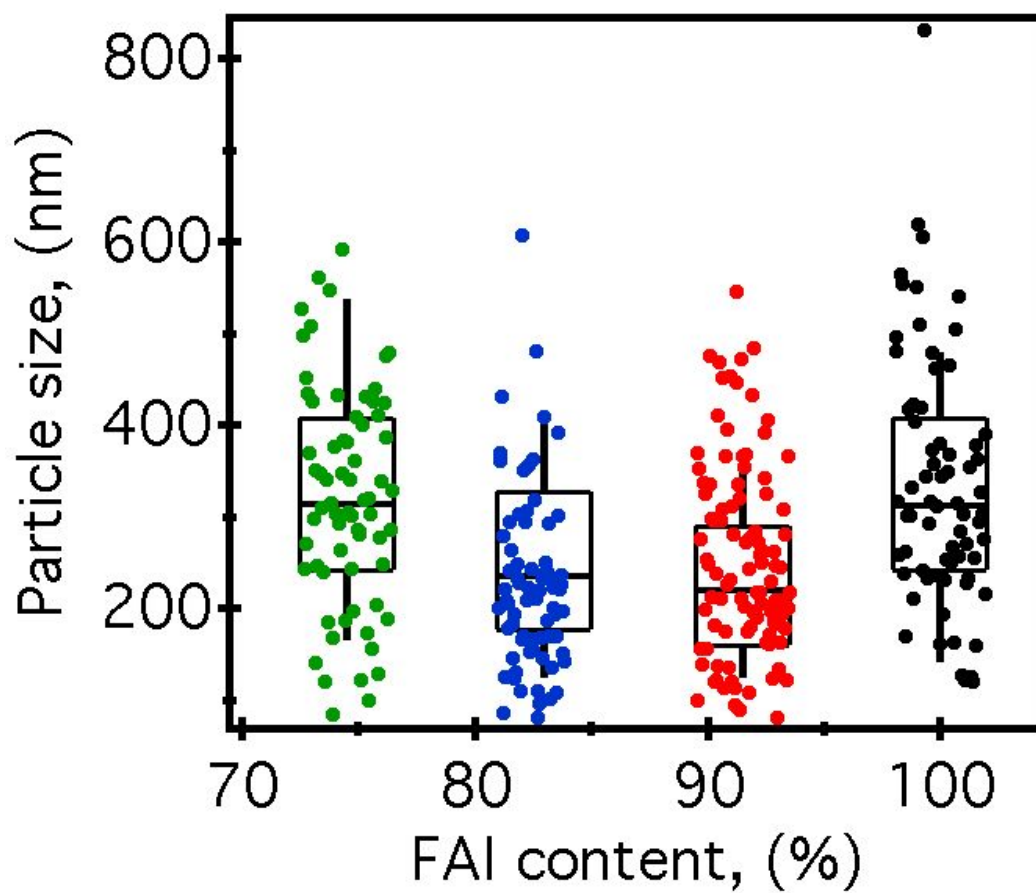* Corresponding author: desparza@uaz.edu.mx, turren@uji.es

Figure S1. The mean diameter and the standard deviation of the grain size distribution as a function of FAPI content.
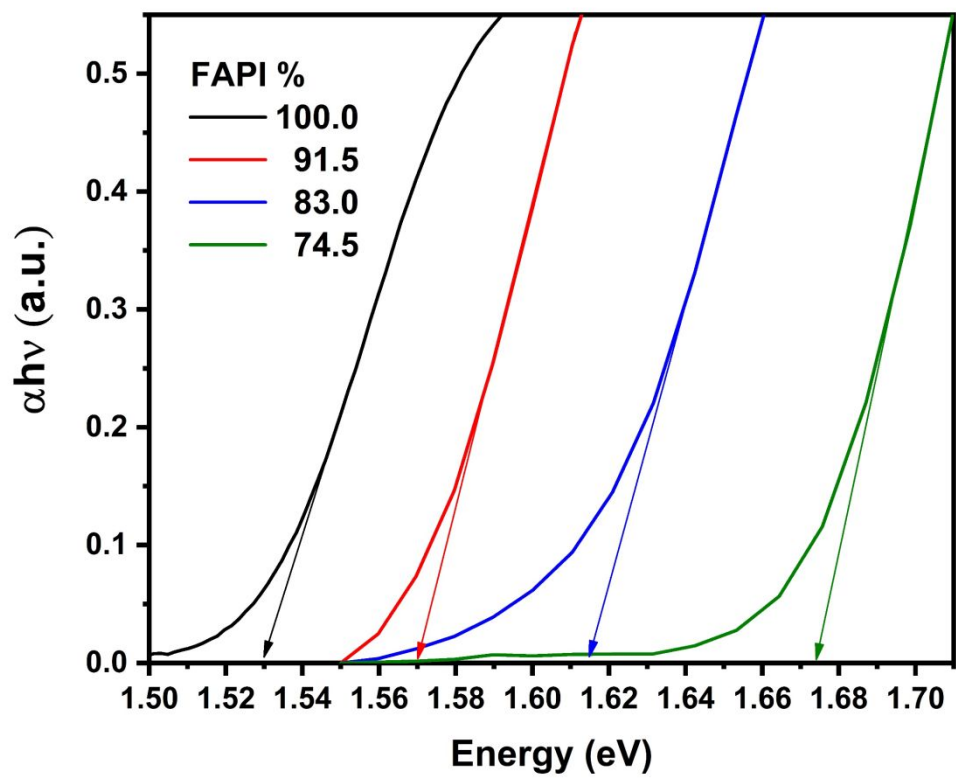
Figure S2. Tauc plot of the different perovskite thin film concentrations.

Table S1. Shows the statistical values of the photovoltaic parameters of 15 samples for each FAPI concentration.

FAI %		J_{sc} (mA/cm²)	V_{oc} (V)	FF (%)	η (%)
100	Best	22.3	0.965	75.5	16.1
	Mean	21.2±0.6	0.941±0.012	72.8±4.1	14.7±0.7
91.50	Best	21.0	1.044	80.6	17.7
	Mean	21.0±0.2	1.012±0.019	76.3±2.4	16.2±0.6
83	Best	20.1	1.124	78.9	18.55
	Mean	20.6±0.3	1.108±0.024	77.0±1.5	17.6±0.7
74.50	Best	18.45	1.158	79.7	17.0
	Mean	18.1±0.5	1.134±0.028	73.8±5.5	15.1±1.2

Table S2. Increase of band gap and V_{oc} for fresh samples.

FAPI %	E_g/q (V)	V_{oc} (V)	$\Delta E_g/q$ (V)	ΔAverage V_{oc} (V)
100	1.53	0.941	0	0
91.50	1.58	1.012	0.05	0.071
83	1.63	1.108	0.1	0.167
74.50	1.68	1.134	0.15	0.193

Table S3. Photovoltaic parameters of the PCSs after 90 days from device fabrication.

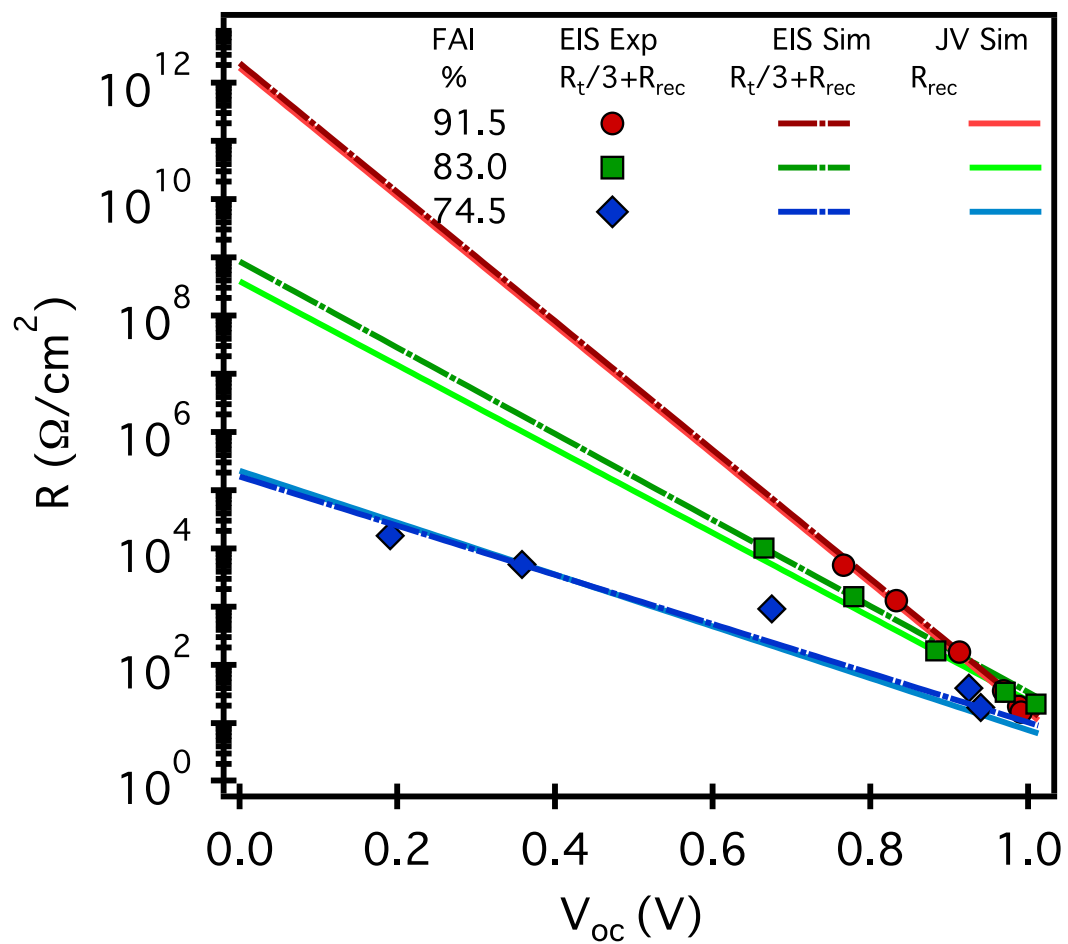| FAI %		Jsc mA/cm2	Voc V	FF %	η %
100	Best	NA	NA	NA	NA
	Mean	NA	NA	NA	NA
91.50	Best	20.6	1.084	62.5	14.0
	Mean	19.3±1.2	1.079±0.014	56.7±8.7	11.8±2.1
83	Best	18.9	1.113	57.7	12.1
	Mean	17.7±1.6	1.075±0.036	52.8±3.2	10.0±1.3
74.50	Best	18.56	1.016	61.16	11.54
	Mean	15.6±2.5	1.037±0.026	61.7±2.3	10.0±1.5

Figure S3. Resistivity vs open circuit voltage of the three different PVSKs.
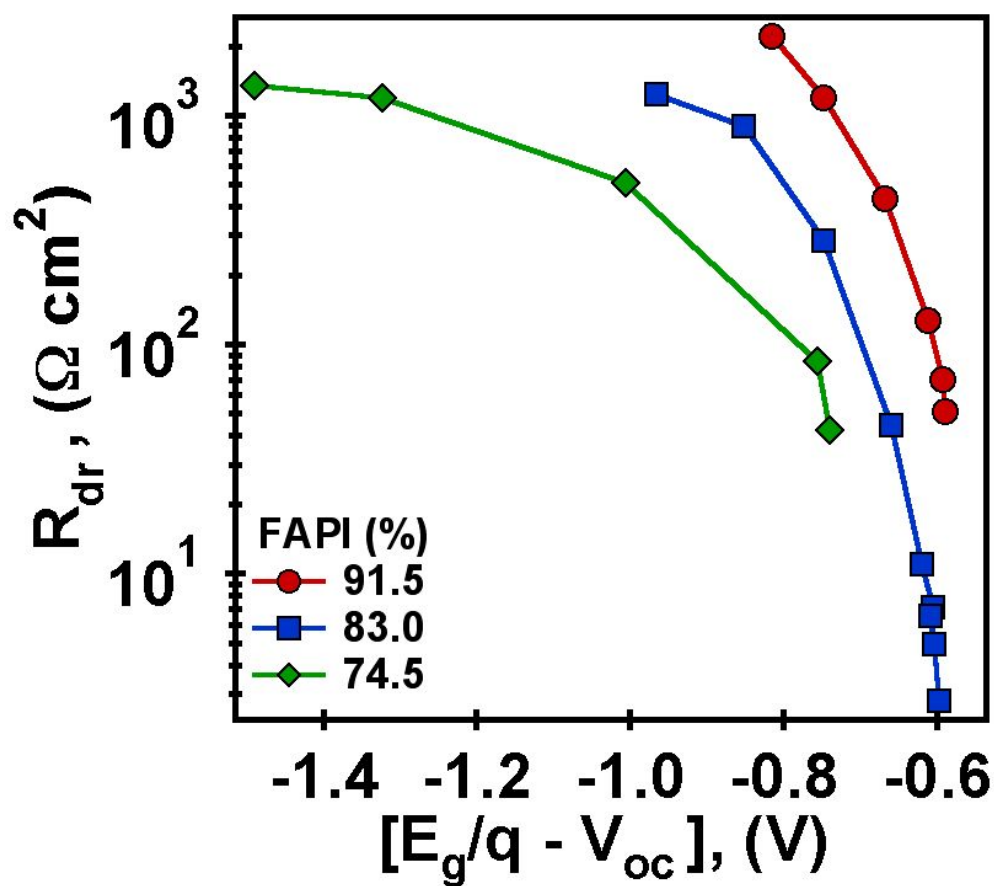
Figure S4. Dielectric relaxation resistance vs open circuit voltage corrected by the optical band gap for three different PVSKs.
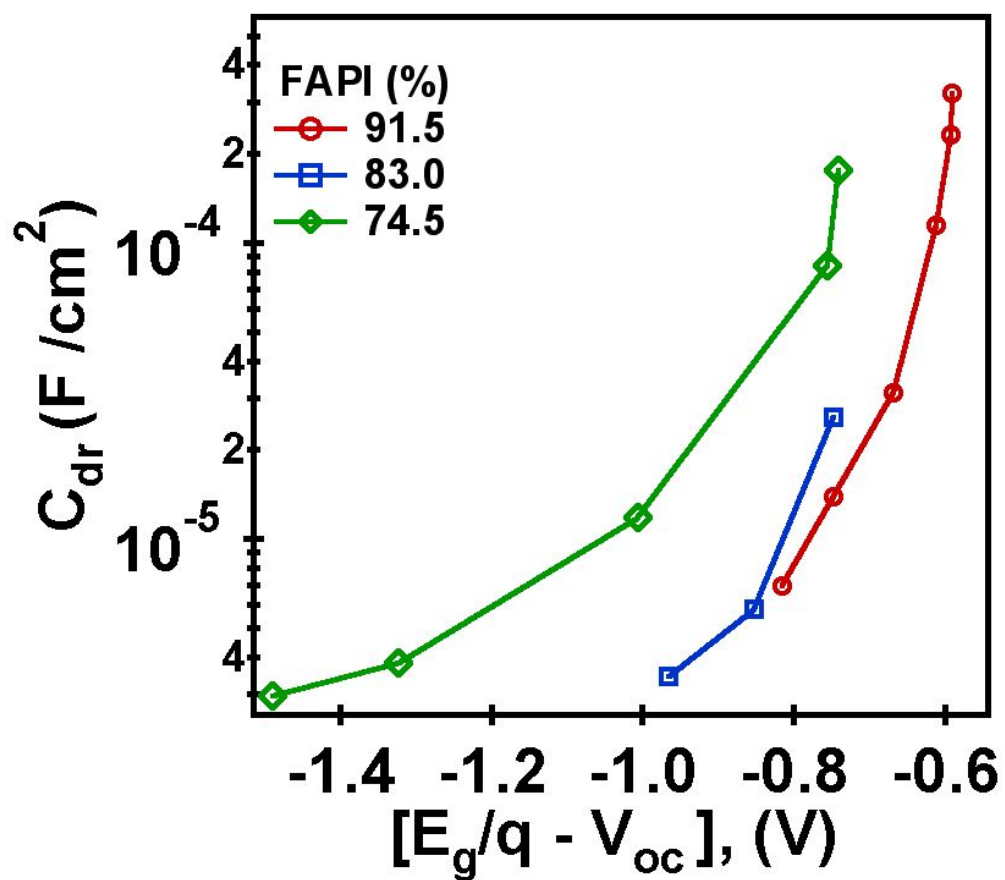
Figure S5. Dielectric relaxation capacitance vs open circuit voltage corrected by the optical band gap for three different PVSKs.
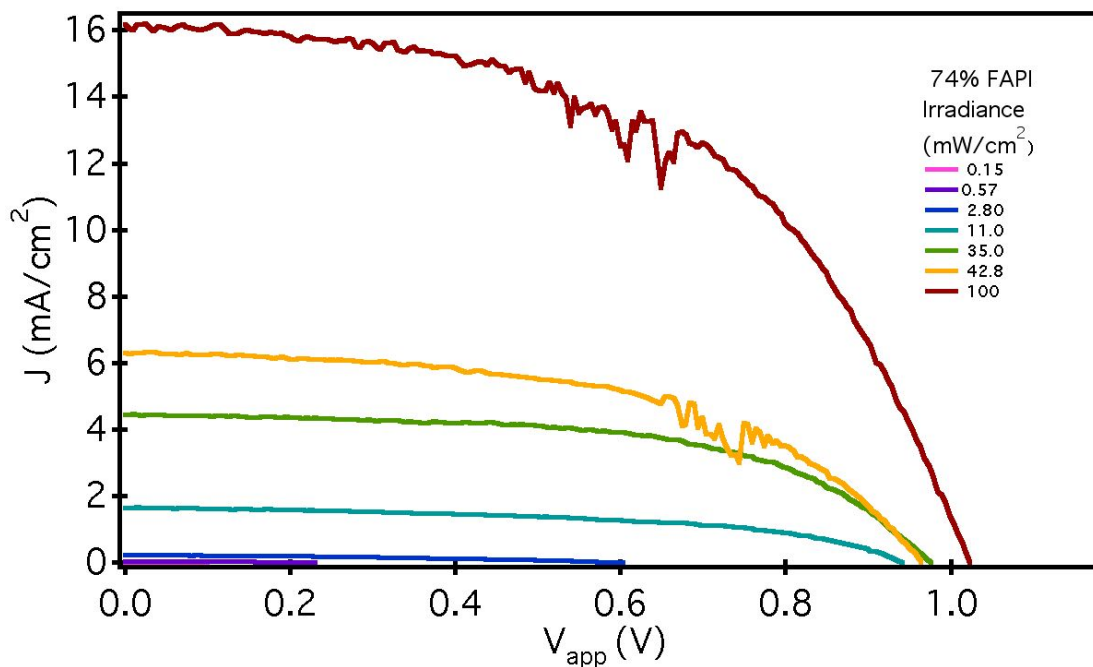
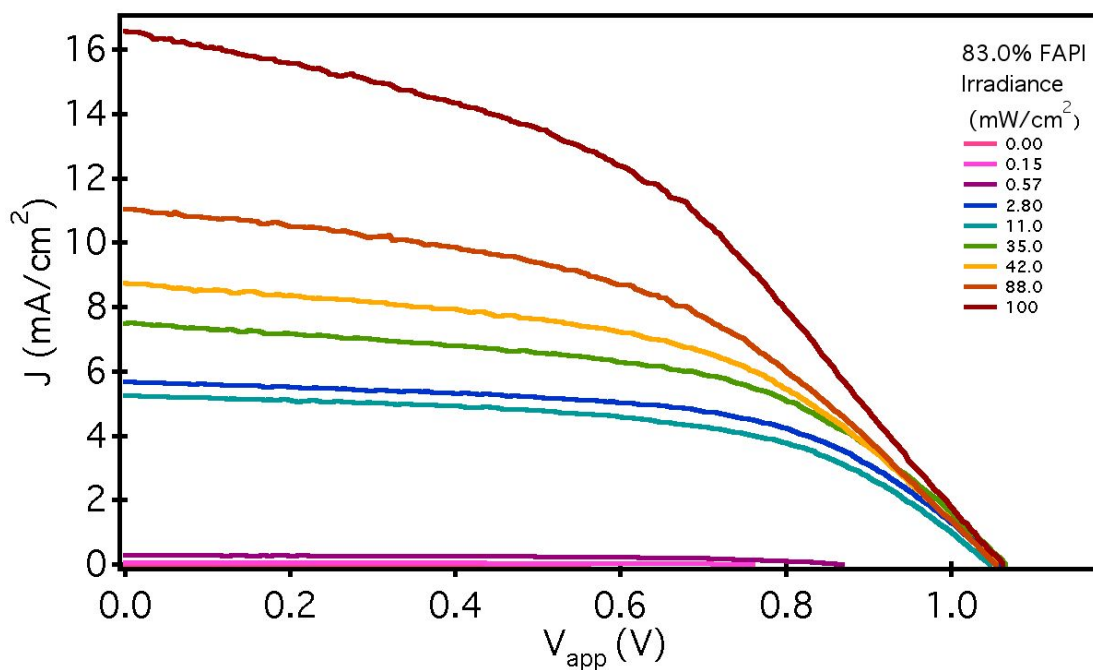**Figure S6.** J-V curves of the PSC with 74.5% of FAPI at several irradiances.

Figure S7. J-V curves of the PSC with 83% of FAPI at several irradiances. S-8
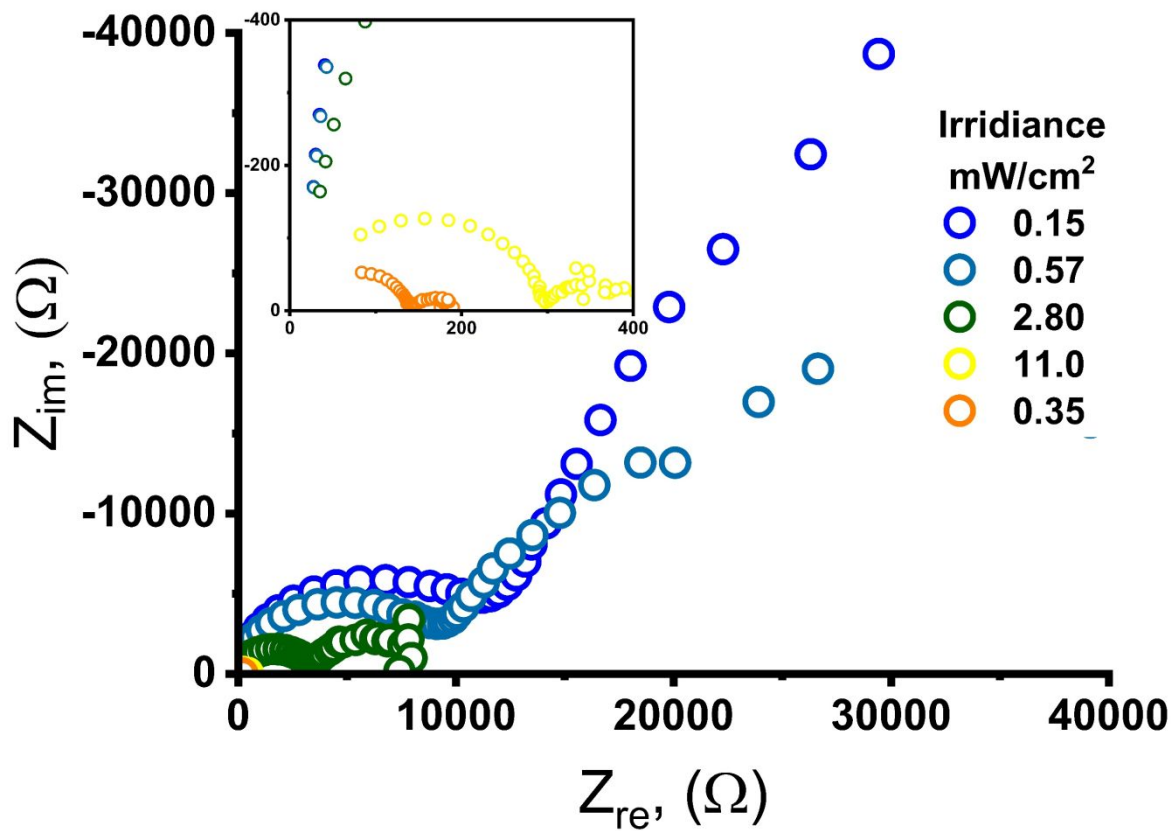
Figure S8. Nyquist plot of the impedances for the sample with 74.5% of FAPI measured under open circuit conditions at several irradiances.
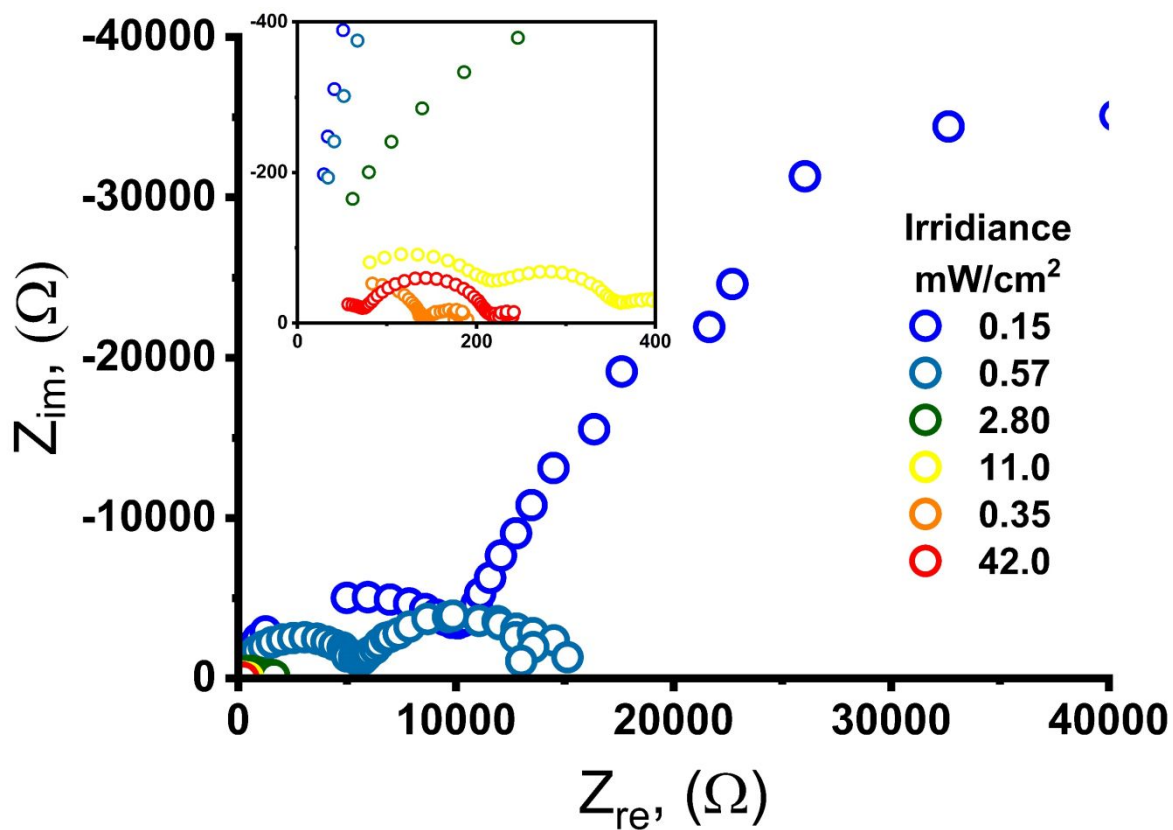
Figure S9. Nyquist plot of the impedances for the sample with 83% of FAPI measured under open circuit conditions at several irradiances.