

ZnO/Ionic Liquid Hybrid Films: Electrochemical synthesis and application in dye-sensitized solar cells.

Eneko Azaceta^a, Jesus Idigoras^b, Jon Echeberria^c, Arnost Zukal^d, Ladislav Kavan^d, Oscar Miguel^a, Hans-Jurgen Grande^a, Juan Antonio Anta^{b*} and Ramon Tena-Zaera^{a*}.

^aEnergy Division, IK4-CIDETEC, Parque Tecnológico de San Sebastián, Paseo Miramón 196, Donostia-San Sebastián, 20009, Spain.

^b Department of Physical, Chemical and Natural Systems, Universidad Pablo de Olavide, Sevilla, 41013, Spain.

^cCEIT and TECNUN (University of Navarra), 20018, San Sebastián, Spain

^d J. Heyrovsky Institute of Physical Chemistry, Academy of Sciences of the Czech Republic, v.v.i. Dolejskova 3, CZ-18223 Prague 8, Czech Republic.

Supplementary information

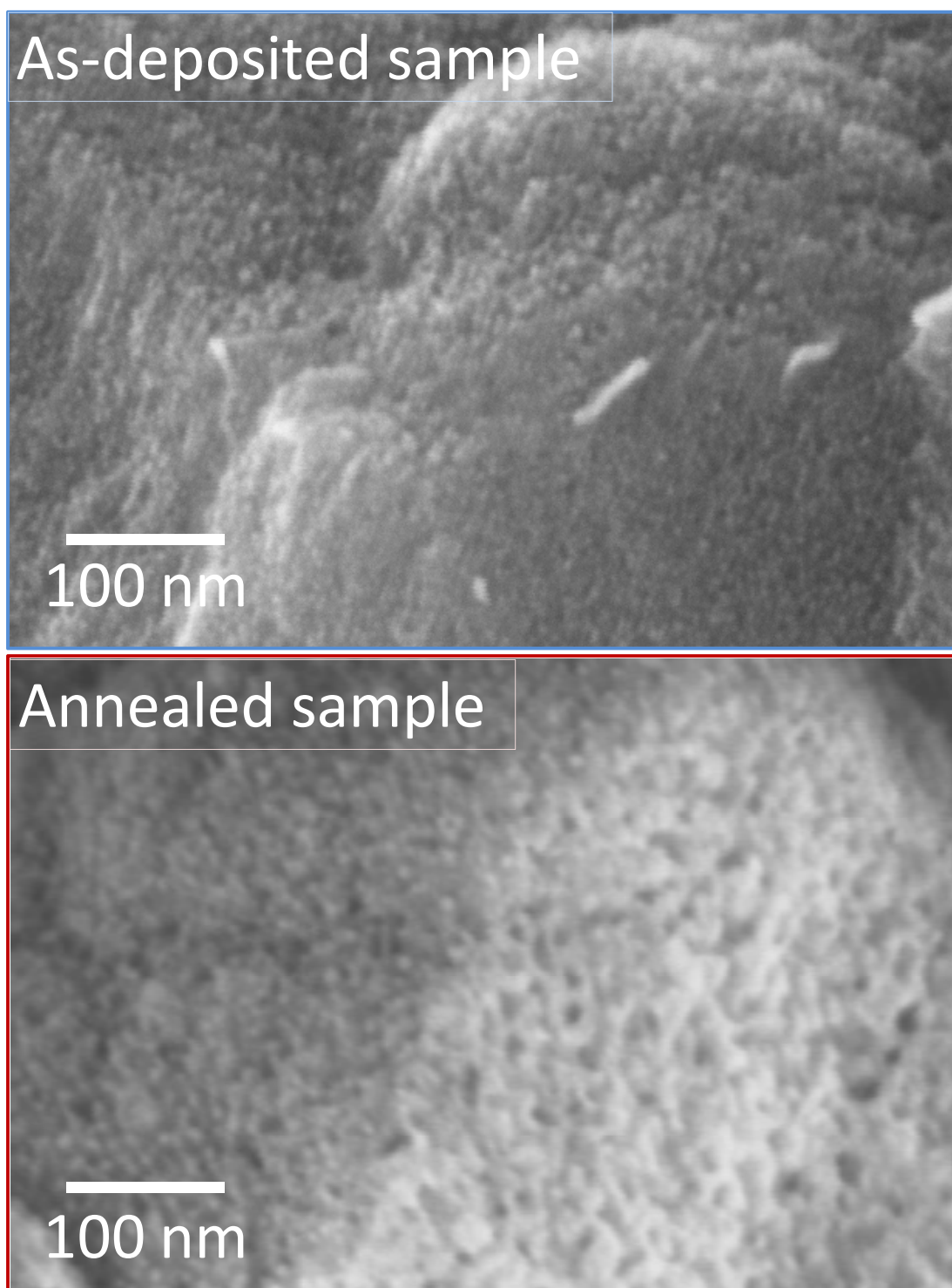
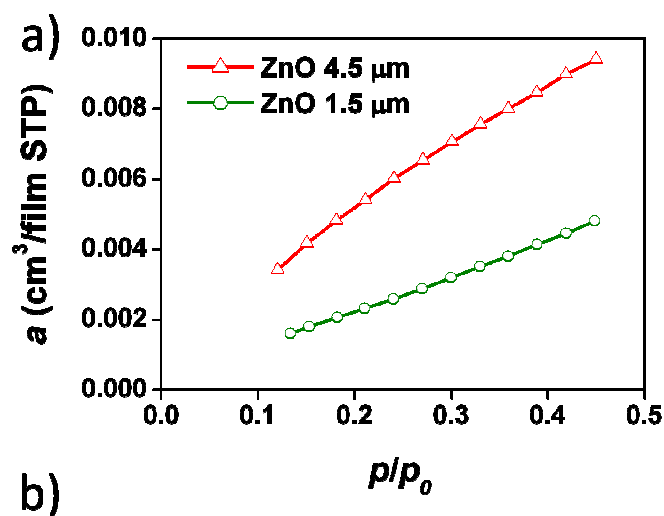


Figure S1: High magnification SEM micrographs of as-deposited (top) and annealed (bottom) samples.



Film	S_{geom} (m ²)	S_{BET} (m ²)	RF
ZnO 1.5 mm	$1.96 \cdot 10^{-4}$	0.019	96.7
ZnO 4.5 mm	$1.93 \cdot 10^{-4}$	0.035	181.1

Figure S2: Adsorption isotherms of krypton at 77 K of ZnO samples (a). The table summarizes the geometric (S_{geom}) and BET surfaces and roughness factor (RF)

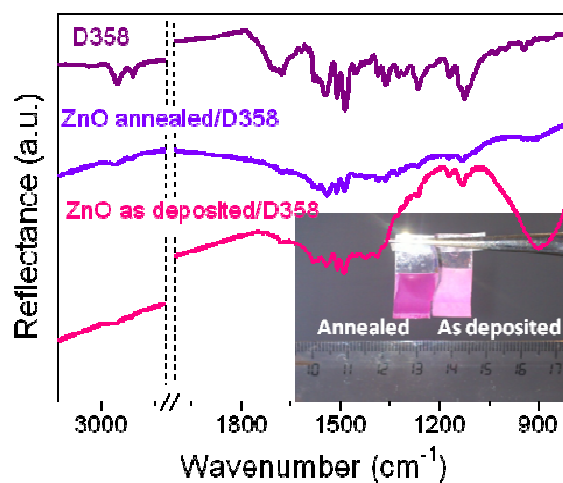


Figure S3: FTIR spectra of D358 dye and ZnO/PYR14TFSI (i.e. as deposited) and ZnO (i.e. annealed) sensitized with D358 dye. The inset depicts a photo of the sensitized samples.

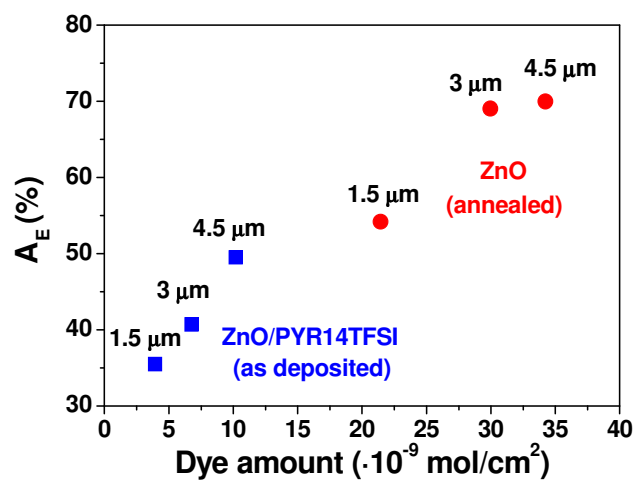


Figure S4: Effective absorption of the studied films as a function of dye loading.

Table S1: Effective absorption in the 370–700 nm range of the AM1.5 solar spectrum versus dye amount of the samples ZnO/PYr14TFSI (i.e. as-deposited, blue) and ZnO (i.e. annealed, red).

	A _E %	J _{sc} mA/cm ²	J _{sc} /A _E -
ZnO/PYR14TFSI 1.5 μm	35.5	4.45	0.125
ZnO/PYR14TFSI 3 μm	40.7	6.58	0.162
ZnO/PYR14TFSI 4.5 μm	49.5	7.84	0.158
ZnO 1.5 μm	54.2	6.37	0.118
ZnO 3 μm	69	7.5	0.108
ZnO 4.5 μm	70	7.94	0.113

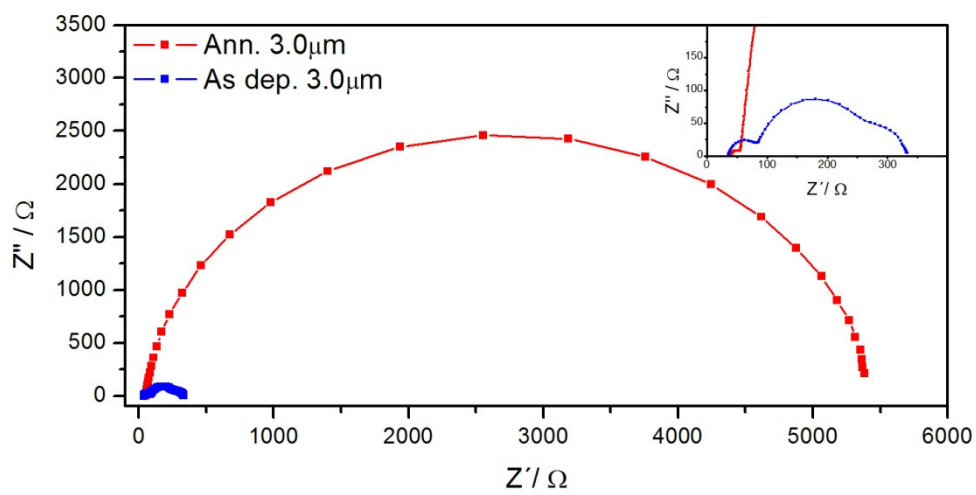
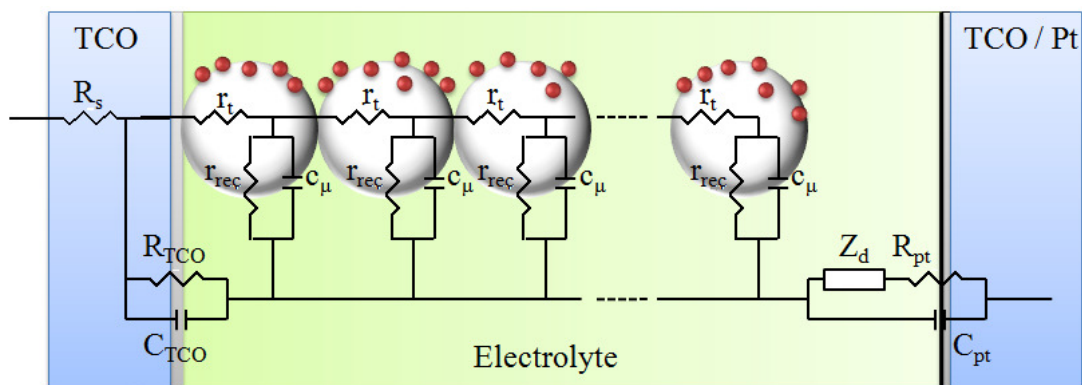


Figure S5: Upper panel: equivalent circuit used to fit the EIS spectra. Lower panel: Nyquist plots of DSC measured at open circuit under illumination at the same approximate value of the electron density, i.e., 500 mV for ZnO (i.e. annealed) samples and 744 mV for ZnO/PYR14TFSI (i.e. as-deposited). See main text for further details.