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Supporting Information

Highly efficient and durable dye-sensitized solar cell based on wet-laid PET membrane electrolyte

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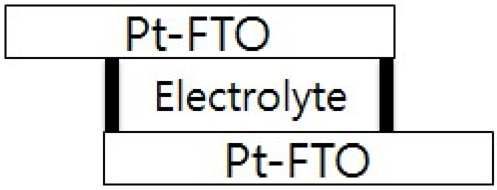


Figure S1. The symmetrical cell used for the measurements

The setup used for electrolyte measurements was designed to be as similar as possible to the application in DSSC and shown in Fig. S1. This electrochemical cell consists of two identical platinized, FTO glass substrates sealed with a surlyn as a spacer.

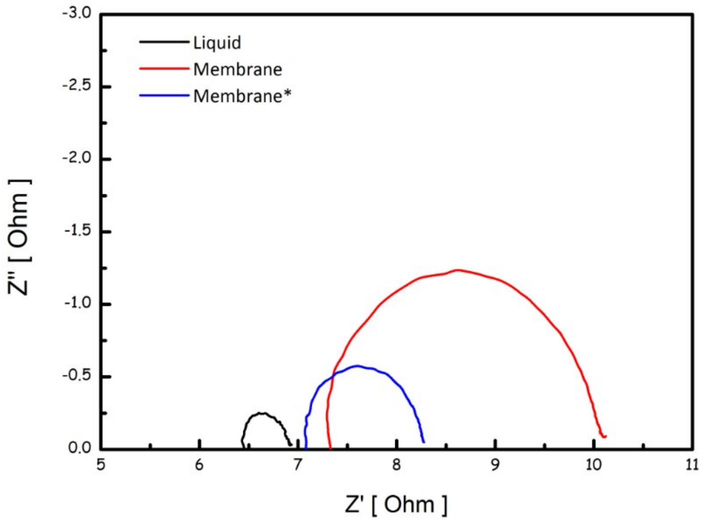


Figure S2. Electrolyte bulk resistance under the frequency range of 0.1 Hz to 100 kHz and AC oscillation of 10 mV

The ionic conductivities of the electrolyte, σ, was calculated by the following equation:

$$\sigma = \frac{l}{RA} \text{ [S cm}^{-1}\text{]} \qquad \text{(Eq. 1)}$$

Where l is the thickness of the web, R is the bulk resistance of electrolyte, and A is the area of the membrane. The bulk resistance was calculated by EIS spectra of the symmetrical cells, represented by the diameter of the semicircles as shown in Fig. S2.

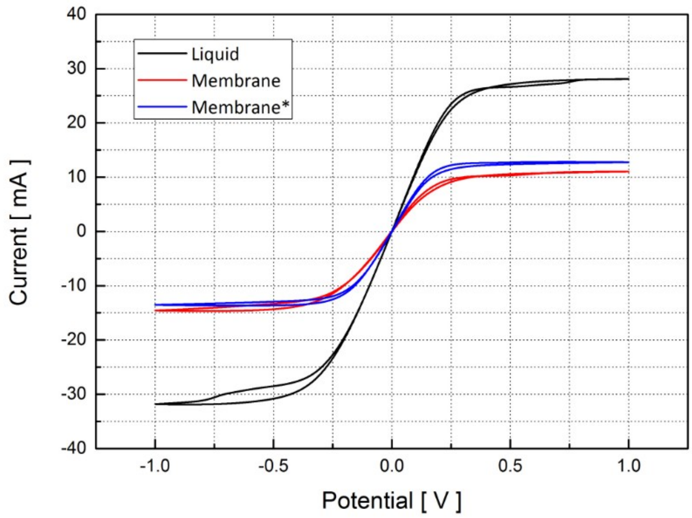


Figure S3. Steady-state current-potential curve of the symmetrical cells using different electrolyte

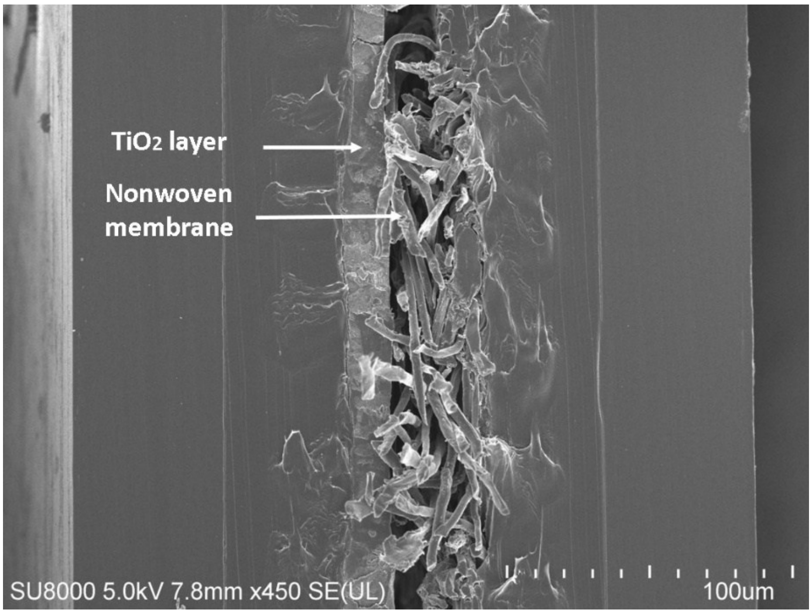
Diffusion coefficient of I_3^- were measured using the same symmetrical cells by tools of cyclic voltammogram using a slow scan rate using a slow scan rate (scan rate: 5 mV/s, potential: -1 to 1 V, Fig. S3). Their results show very small hysteresis, steady-state conditions. In that graph, the diffusion-limited current is proportional to the diffusion constants of I_3^-, it denoted by $D_{I_3^-}$, obtained through following equation.

$$D_{I_3^-} = \frac{I_{lim} \times l}{2 \times n \times F \times C_{I_3^-} \times A} \quad [cm^2\ S^{-1}]$$

(Eq. 2)

Where I_{lim} is diffusion-limited current, n is number of electrons transferred, F is faraday constant, $C_{I_3^-}$ is concentration of I_3^-.

Figure S4. FE-SEM cross sectional images of nonwoven in contact with the Titanium oxide coated electrode



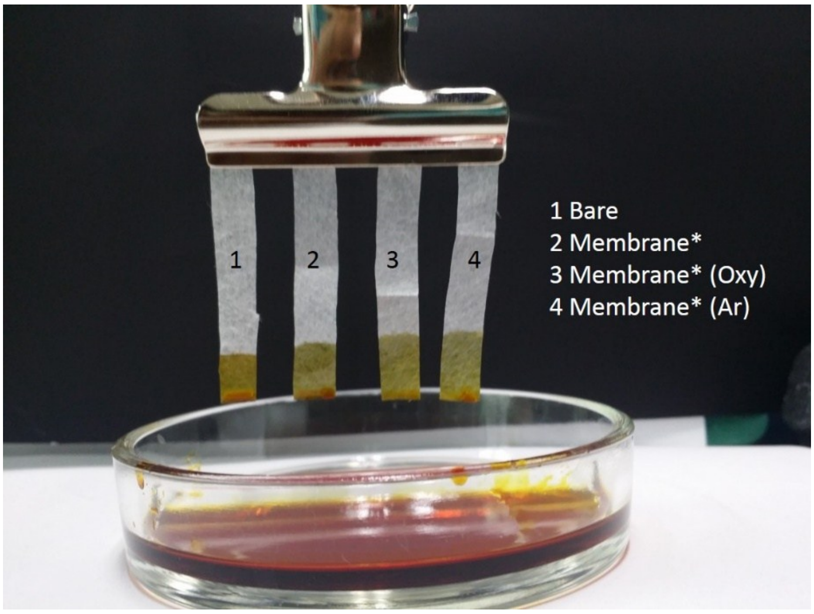


Figure S5. Wicking test analysis of nonwoven PET membrane in electrolyte

The test was performed with a sample size of 4 cm x 0.5 cm and the samples were dipped in the electrolyte solution (2 mm) for 60 sec and the measurement was performed after 60 sec to enable the nonwoven to complete the wicking inside the porous structure. Results are as following, 1: 0.8, 2: 0.9, 3: 1.2 and 4: 1.2 cm.