**Electronic Supplementary Information**

**Amphiphilic graft copolymers as templates for the generation of binary metal oxide mesoporous interfacial layers for solid state photovoltaic cells**

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**Figure S1.** Synthesis of amphiphilic PECH-*g*-PS graft copolymers *via* ATRP.

도표, 스케치, 텍스트, 화이트이(가) 표시된 사진

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**Figure S2.** FT-IR spectra of amphiphilic PECH-*g*-PS graft copolymers.

텍스트, 라인, 폰트, 도표이(가) 표시된 사진

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**Figure S3.** (a) SEM-EDS element mapping scan area, (b) Ti, and (c) Zn elemental maps of bi-MO meso IF layer TZ1.

텍스트, 스크린샷, 직사각형, 문구용품이(가) 표시된 사진

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**Figure S4.** FE-SEM surface images of (a) bi-MO meso IF layer TZ0, (b) bi-MO meso IF layer TZ2 and (c) bi-MO meso IF layer TZ3.

텍스트, 스크린샷, 자연, 분화구이(가) 표시된 사진

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**Figure S5.** (a) SEM-EDS element mapping scan area, (b) Ti, and (c) Zn elemental maps of bi-MO meso IF layer TZ2.

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**Figure S6.** (a) SEM-EDS element mapping scan area, (b) Ti, and (c) Zn elemental maps of bi-MO meso IF layer TZ3.

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**Figure S7.** equivalent circuit diagram.

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**Figure S8.** EIS Nyquist plots under dark condition.

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**Figure S9.** *J-V*  curves of bi-MO meso IF layer based solid state photovoltaic cells with commercial scattering layer under 1 sun illumination (AM 1.5 G, 100 mW/cm2).a,b,c,d

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a Solid-state electrolyte consists of PEG, LiI, MPII, and I2 in acetonitrile.

b The photoactive area for solid state photovoltaic cells was 0.16 cm2.

c The thickness of the photoanode was approximately 7 μm.

d The commercial scattering layer was approximately 5 µm thick.

**Table S1.** Comparison of photovoltaic parameters of solid state photovoltaic cells with mesoporous layer reported in the literature.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Mesoporous layer | Solid-state electrolyte | *Voc*  (V) | *Jsc*  (mA/cm2) | *FF* | *η*  (%) | Reference |
| bi-MO meso IF layer | PEG | 0.74 | 9.8 | 0.69 | 5.0 | This work |
| bi-MO meso IF layer  w/ Scattering layer | PEG | 0.67 | 15.5 | 0.62 | 6.4 | This work |
| Mesoporous TiO2 bead | HPC | 0.70 | 16.5 | 0.67 | 7.8 | [40] |
| TiO2 film | MXene | 0.78 | 15.0 | 0.66 | 7.8 | [41] |
| TiO2 film | Cs2SnI6 | 0.62 | 10.62 | 0.62 | 4.1 | [42] |
| TiO2 film | PEG/WO3 | 0.71 | 14.6 | 0.61 | 6.3 | [43] |
| TiO2 film | PEG/ZrO2 | 0.66 | 14.0 | 0.61 | 5.6 | [44] |
| TiO2 film | PEG | 0.64 | 13.6 | 0.65 | 5.7 | [45] |
| TiO2 film | PEG/ZIF-67 | 0.68 | 10.1 | 0.65 | 4.6 | [46] |