Morphology-Controlled CH$_3$NH$_3$PbI$_3$ Films by Hexane-Assisted One-Step Solution Deposition for Hybrid Perovskite Mesoscopic Solar Cells with High Reproductivity

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**Figure S1.** Typical SEM images of CH$_3$NH$_3$PbI$_3$ perovskite spin-coated on mesoporous-TiO$_2$ layer by (a-b) conventional and (c-d) n-hexane-assisted one-step solution deposition.

**Figure S2.** Typical SEM images of CH$_3$NH$_3$PbI$_3$ perovskite spin-coated on compact TiO$_2$ layer by dripping n-hexane at different delay times from the start of the spin coating process. (a-b) 6~8s; (c-d) 12~14s.
Figure S3. Comparison of crystallinity for perovskite films prepared by conventional and n-hexane-assisted one-step solution deposition. Full width half at maximum values of the (110) diffraction peak at 14.2° were obtained by Gaussian fit.

Figure S4. Box plots of the device performance parameters of FTO/c-TiO₂/m-TiO₂/CH₃NH₃PbI₃/Spiro-OMeTAD/Au devices with and without n-hexane dripping during the CH₃NH₃PbI₃ perovskite deposition process.

Figure S5. The IPCE of FTO/c-TiO₂/ m-TiO₂/CH₃NH₃PbI₃/Spiro-OMeTAD/Au devices with and without n-hexane
dripping during the CH$_3$NH$_3$PbI$_3$ perovskite deposition process.

**Figure S6.** Photocurrent density and power conversion efficiency as a function of time for the FTO/c-TiO$_2$/m-TiO$_2$/CH$_3$NH$_3$PbI$_3$/Spiro-OMeTAD/Au cells with and without hexane-assisted solution deposition process held close to 0.58 V and 0.62 V forward bias respectively.

**Figure S7.** The $J$–$V$ characteristics of FTO/c-TiO$_2$/CH$_3$NH$_3$PbI$_3$/Spiro-OMeTAD/Au solar cells with and without hexane-assisted solution deposition process.
Figure S8. The dark current curves of devices with and without $n$-hexane dripping during the CH$_3$NH$_3$PbI$_3$ perovskite deposition process.

Figure S9. Relative efficiencies of perovskite solar cells versus time stored in air at room temperature under about 50% humidity without encapsulation, in which the perovskite films are fabricated with and without $n$-hexane dripping during the CH$_3$NH$_3$PbI$_3$ deposition process.