

Supporting Information

Facile External Treatment for Efficient Nanoscale Morphology Control of Polymer Solar Cells Using Gas- assisted Spray Method

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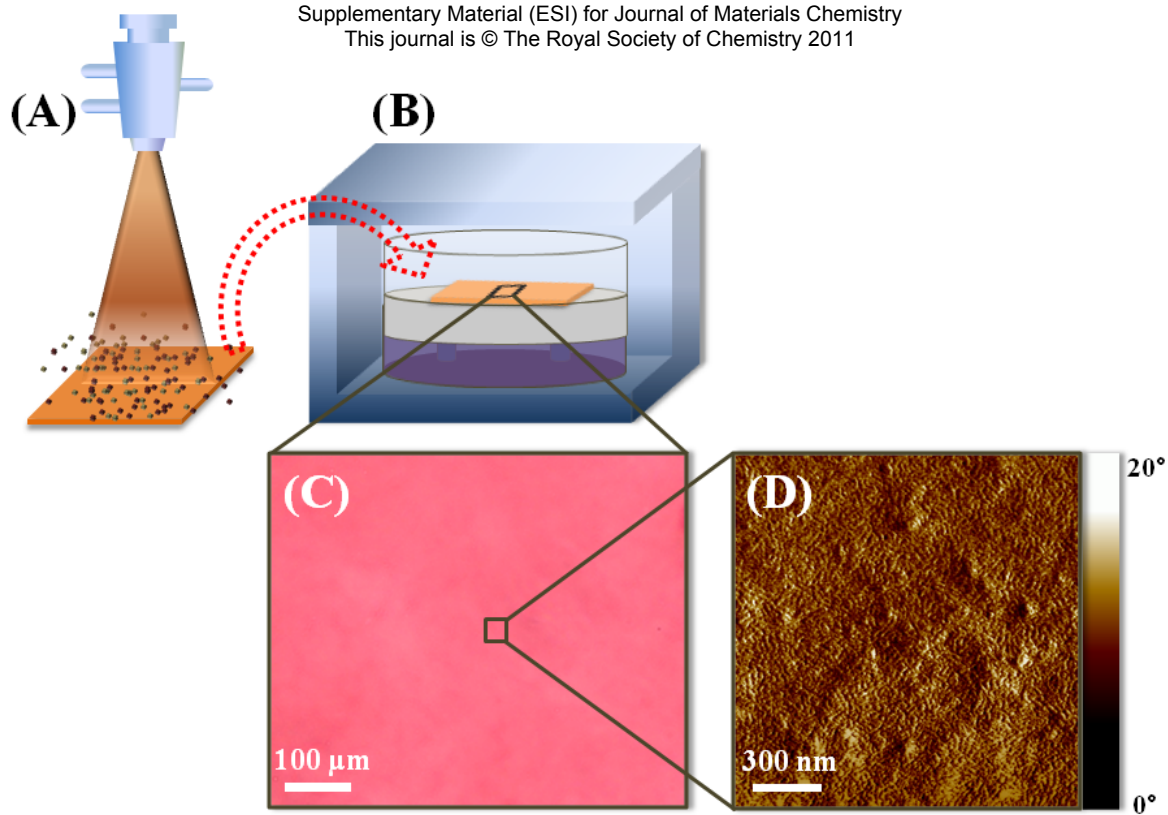


Figure S1. Schematic description of the SVS treatment for P3HT/PCBM blend active layer preparation; (A) g-spray method (B) SVS treatment using CB, (C) the OM image of an g-sprayed blend film after SVS treatment for 1 h (D) TM-AFM images ($1\mu\text{m} \times 1\mu\text{m}$) of an g-sprayed blend film after SVS treatment.

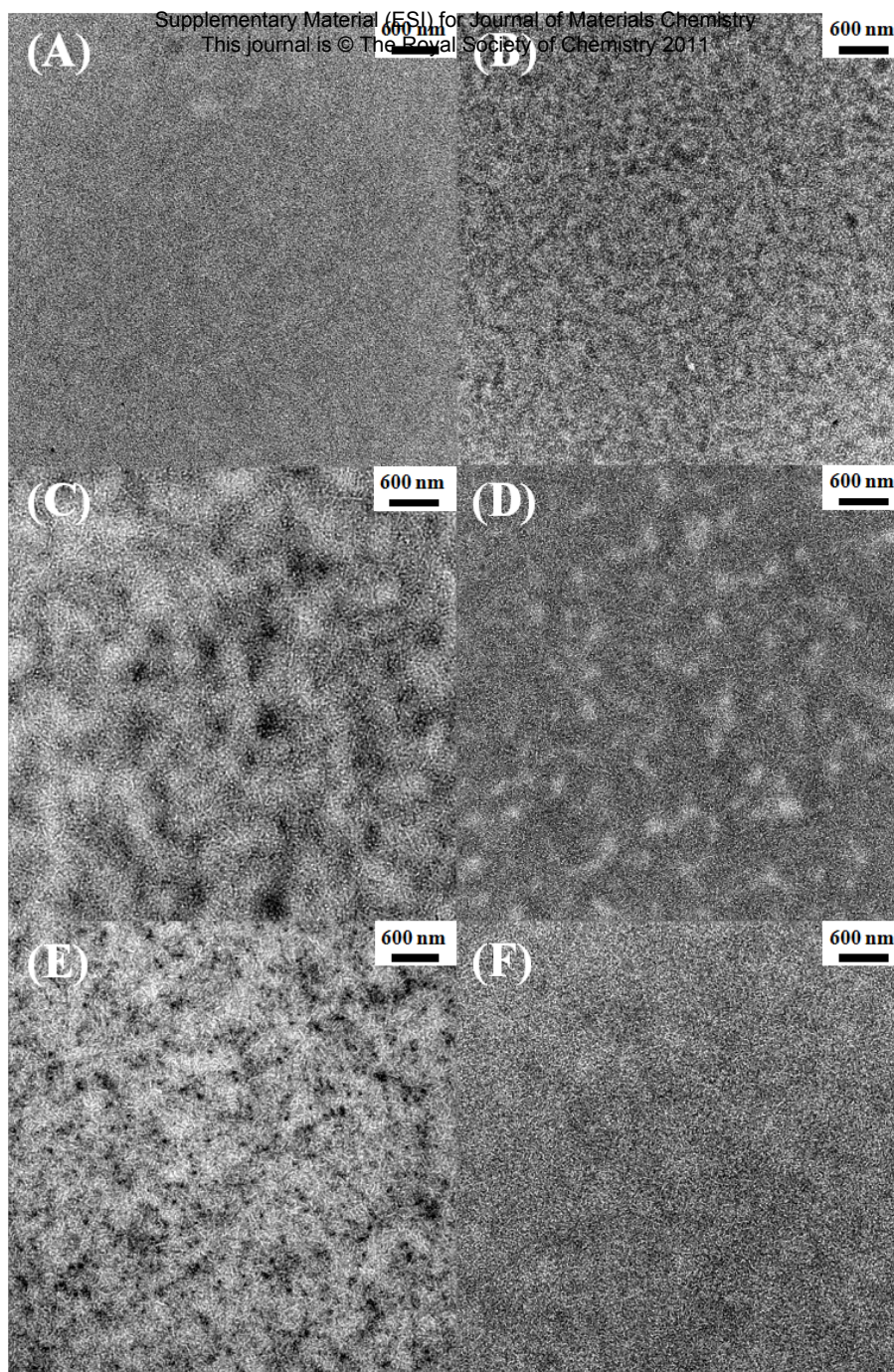


Figure S2. BF-TEM images of g-sprayed P3HT/PCBM blend films; (A) as g-sprayed, (B) after TA, (C) after SVS, (D) after SVS/TA, (E) after SSO, (F) after SSO/TA. The thickness of blend films was ~ 100 nm. The treatment time for SVS was 1 h at room temperature. The spray time for SSO was 2 seconds. TA was performed at 135°C for 15 minutes under N_2 .

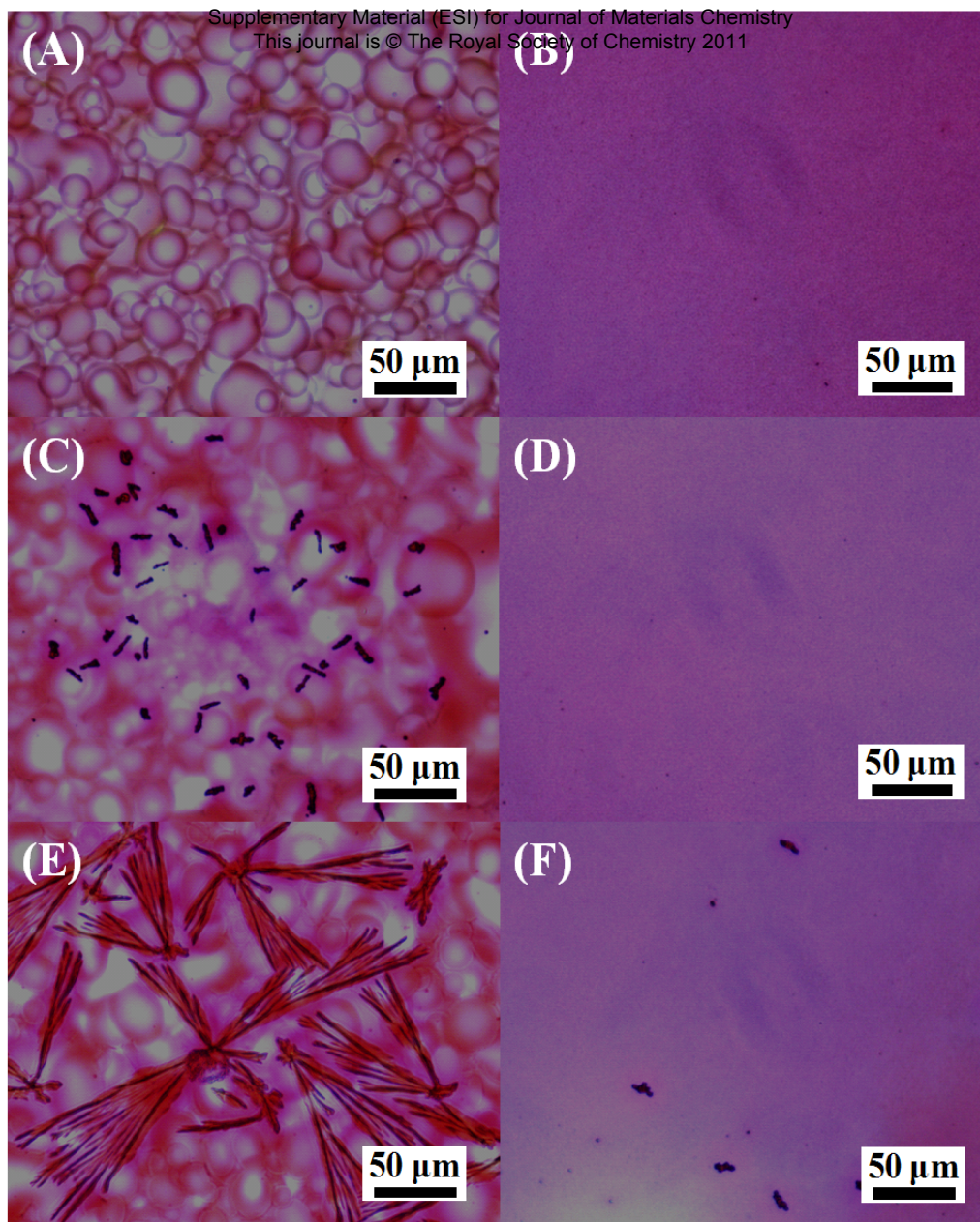


Figure S3. OM images ($\times 600$) of the g-sprayed P3HT/PCBM blend films on the PEDOT/PSS coated ITO/glass. (A) as g-sprayed films, (B) g-sprayed films after SSO, (C) as g-sprayed films after TA for 15 min., (D) g-sprayed films after SSO followed by TA for 15 min., (E) as g-sprayed films after TA for 30 min., (F) g-sprayed films after SSO followed by TA for 30 min. The spray time for SSO was 2 seconds. TA was performed at 135 °C under N_2 . The PCBM cluster growth in the blend films upon TA progress was clearly observed. In the SSO treated blend films, the suppressed PCBM growth was indicated while the excessive growth was observed in the as g-sprayed blend films.

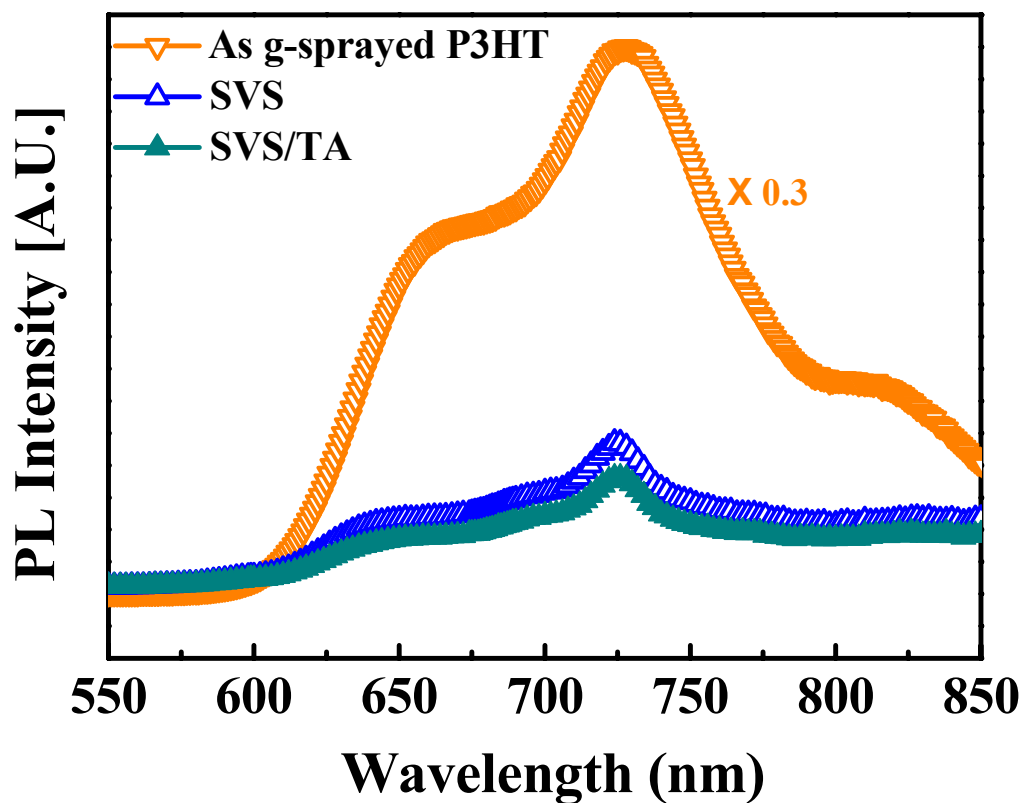


Figure S4. PL spectra of g-sprayed films; as g-sprayed P3HT films: ▽, the P3HT/PCBM blend films after SVS: △, the P3HT/PCBM blend films after SSO/TA: ▲. The excitation wave length was 480 nm.

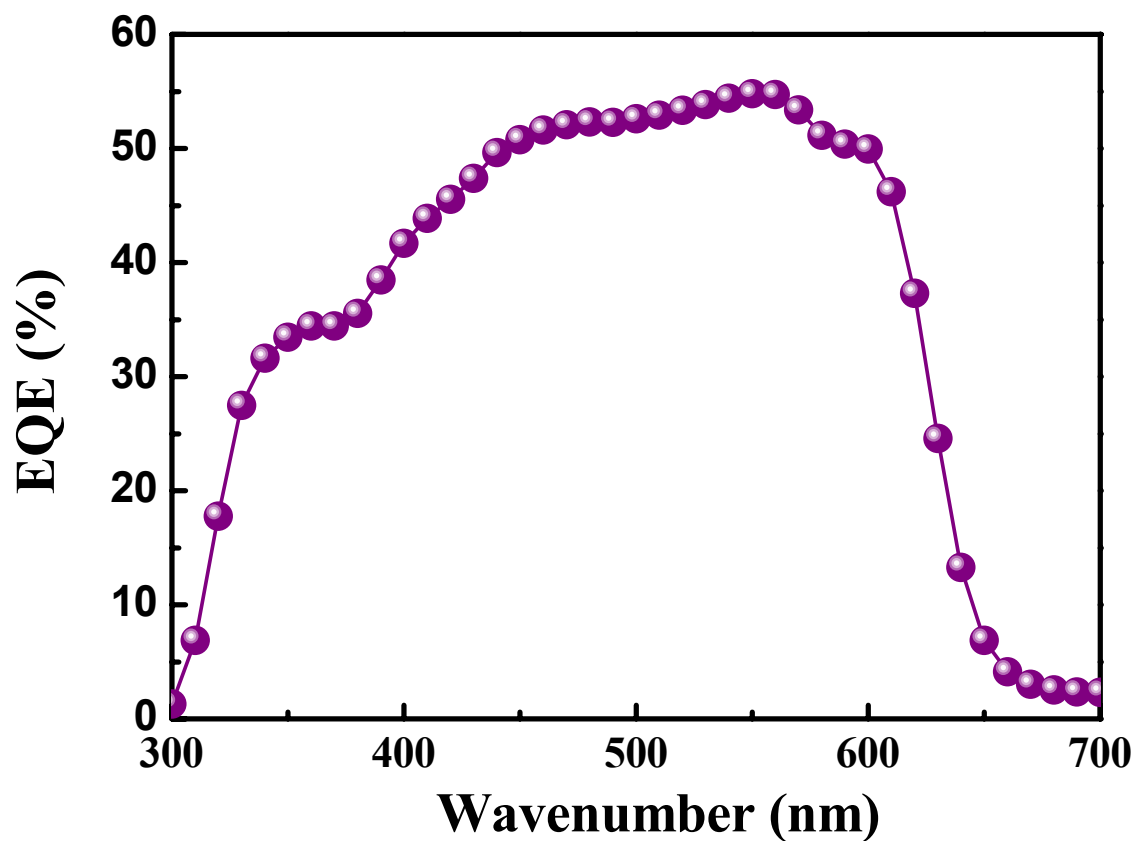


Figure S5. External quantum efficiency (EQE) spectra of g-sprayed PSC-SSO-TA. EQE was measured as a function of wavelength from 300 to 800 nm using incident photo-to-current conversion system (IPCE) (PV measurements, Inc.). Calibration was performed using a silicon photodiode G425, which was NIST-calibrated as a standard.