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&
TWELFTH WORLD ROUND TABLE CONFERENCE
ON SINTERING
XII WRTCS**

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P.S.I.A.3.

Supercritical CO₂ assisted deposition of MAPbBr₃ perovskite onto TiO₂ nanotubes

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Supercritical carbon dioxide (sCO₂) is an ideal low-temperature cosolvent for perovskite deposition due to its relatively low critical point (31.2 °C, 73.8 bar), no surface tension, liquid-like density, gas-like viscosity, and diffusivity. It enables faster mass transfer which allows penetration of crystals in nanoporous structure. The study investigates the influence of time of deposition of perovskite assisted with supercritical carbon dioxide on the filling of nanotubes. Perovskite solar cell technology has been developed so fast due to several factors including a tunable band gap, high absorption coefficient, and low-cost fabrication. The quality of the perovskite film is important for the high efficiency of perovskite solar cells. Perovskite precursors are usually deposited from the solution onto a substrate using spin-coating followed by post-deposition treatments, but often it results in low-quality films that cannot provide good photovoltaic performances. Deposition of perovskite in the presence of sCO₂ is a promising method for the formation of high-quality perovskite layers. In this work, methylammonium lead bromide perovskite (MAPbBr₃) was deposited on TiO₂ nanotubes from the solution in dimethylformamide (DMF) by application of sCO₂ at 35 °C and 200 bar for 1 h, and 3 h. FESEM results show that TiO₂ nanotubes were filled with perovskite material in both cases. The diffuse reflectance spectroscopy measurement of samples proved that the absorption edge of prepared TiO₂ nanotubes/MAPbBr₃ was extended to the visible range. Measurement of I-V characteristics showed that the sample made for 3 h had a higher value of current than the sample prepared for 1 h. The application of sCO₂ during the deposition of perovskite has enabled the preparation of a photodiode with a better contact between TiO₂ nanotubes and perovskite which is important for the future development of solar cells.