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## Morphology control of titania films at low temperature

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A low-temperature routine to realize inorganic hole-blocking layers (HBLs) is important for the commercialization of perovskite solar cells. Fabricating HBLs at low temperature is energy-saving and compatible with flexible substrates. In this work, titania thin films are synthesized at low temperature with the sol-gel method templated by a diblock copolymer. Tailoring titania film morphology in the low-temperature process is achieved by managing phase separation of the polymer template. The ratio of polymer, precursor, solvent, and catalyst for the sol-gel solution is varied to tune the thin film morphologies. The surface morphologies of films are probed via scanning electron microscopy and GISAXS. The optical properties are examined with ultraviolet-visible spectroscopy and photoluminescence spectra.

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