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Optical behavior of the conjugated polymer MEH-PPV thin films stretched in bi-layer dwetting by an unstable layer PO-TSUN CHEN, ARNOLD C.-M. YANG, Department of Materials Science and Engineering, National Tsing Hua University, Hsinchu, Taiwan 30013 — Molecular packing and chain conformation play important roles in the optoelectronic performance of conjugated polymer thin films. It has been shown that by virtue of stretching via dewetting, the photoluminescence (PL) efficiencies of rarefied MEH-PPV thin films may be dramatically enhanced. To result similar effects in the stable non-diluted pristine MEH-PPV thin films, bi-layer dewetting was attempted in samples of MEH-PPV thin films (∼7nm) covered by one layer of polystyrene (PS) (∼40nm) that dewetted in toluene vapor to form droplets (height ∼300 nm) and ultrathin residual layer (∼3nm) on the substrate. The instability was initiated from the PS layer in which small pinholes first emerged upon the intake of the solvent vapor. The pinholes then expanded and deepened into the underlying MEH-PPV, forcing the conjugated film to dewet. As a result of the stretching induced by the dewetting, the PL peak blue-shifted 20 nm to 540 nm and the intensity was enhanced around 10 times. Revealed by the position-sensitive confocal PL data, the huge enhancement came from both the droplet and residual layer, caused by molecular separation and stretching. Electroluminescence devices are being made based on these stretched MEH-PPV films.

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