Comparison of ultramicrotomy and focused-ion-beam for the preparation of TEM and STEM cross section of organic solar cells - DTU Orbit (31/12/2018)

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The challenge of preparing cross sections of organic photovoltaics (OPV) suitable for transmission electron microscopy (TEM) and scanning TEM (STEM) is addressed. The samples were polymer solar cells fabricated using roll-to-roll (R2R) processing methods on a flexible polyethylene terephthalate (PET) substrate. Focused ion beam (FIB) and ultramicrotomy were used to prepare the cross sections. The differences between the samples prepared by ultramicrotomy and FIB are addressed, focusing on the advantages and disadvantages of each technique. The sample prepared by ultramicrotomy yielded good resolution, enabling further studies of phase separation of P3HT:PCBM by means of energy filtered TEM (EFTEM). The sample prepared by FIB shows good structure preservation, but reduced resolution due to non-optimal thicknesses achieved after treatment. Degradation studies of samples prepared by ultramicrotomy are further discussed, which reveal particular effects of the ISOS-L-3 aging test (85 °C, 50% R.H., 0.7 Sun) onto the sample, especially pronounced in the silver layer.

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