

INK-JET PRINTING OF POLYMER SOLAR CELLS.

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Polymer solar cells to date have primarily been fabricated using non-scalable vapor deposition and spin-coating techniques. Ink-jet printing emerges as a viable technology to achieve solution based deposition on flexible substrates, as well as, having the potential for large scale production. The use of a Fujifilm Dimatix DMP-2800 piezoelectric printer was evaluated as a suitable production technique. The active layer consisting of poly(3-hexyothiophene-2,5-diyl) (P3HT) and a fullerene derivative, phenyl C61 butyric acid methyl ester (PCBM[60]), was deposited onto a poly(3,4-ethylenedioxythiophene)/ poly(styrenesulfonate) (PEDOT:PSS) hole transport layer. Printed layer morphology was analyzed using optical and contact profilometry to correlate printer conditions (i.e. drop spacing, nozzle voltage, and firing frequency) with film thickness and surface roughness measurements. A study comparing the effects of a co-solvent on composite dispersion, substrate wetting, and film uniformity has been performed. The use of mesitylene in concert with ortho-dichlorobenzene produced the highest efficiency device equal to 2.5% under one sun AM1.5 solar illumination. Ink-jet printing of polymer solar cells proves to be a promising and valuable fabrication technique for producing efficient photovoltaic devices.