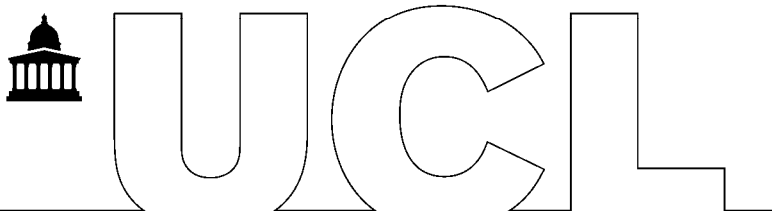
**DEPARTMENT OF ELECTRONIC & ELECTRICAL ENGINEERING**



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**PAPER TITLE:** Patterning the Active Layer of Polymer Solar Cells by Thermal and Nanoimprint Lithography

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**ABSTRACT:**

Although organic solar cells have huge advantages such as their low cost, light weight and potential flexibility, industrial scale application is hindered by their low lifetime and relatively low efficiency. One way to improve the efficiency of polymer-fullerene double layer cells is to increase the interfacial area by creating a structured polymer layer. We employed two significantly different methods:
Thermal lithography by means of an AFM with a resistively heated tip was used to pattern the prototypical conjugated polymer poly(p-phenylene vinylene) (PPV) on indium tin oxide surfaces. These surfaces are not only useful for electronic applications such as solar cells and LEDs, but they also have a higher thermal conductivity (8.7 W/(m K)) than fused silica (1.4 W/(m K)), the only substrate that has been used in the past for this novel lithography technique. Despite tip curvatures of ca. 5 µm, we produced lines with widths (full width at half maximum) of less than 40 nm as revealed by atomic force microscopy.
The second applied technique is nanoimprint lithography by a self-designed hot-embossing device. We used soft PDMS as well as hard silicon stamps to imprint the currently most effective polymer for organic solar cells, poly(3-hexylthiophene) (P3HT). The resulting films were mainly analysed by optical and atomic force microscopy.