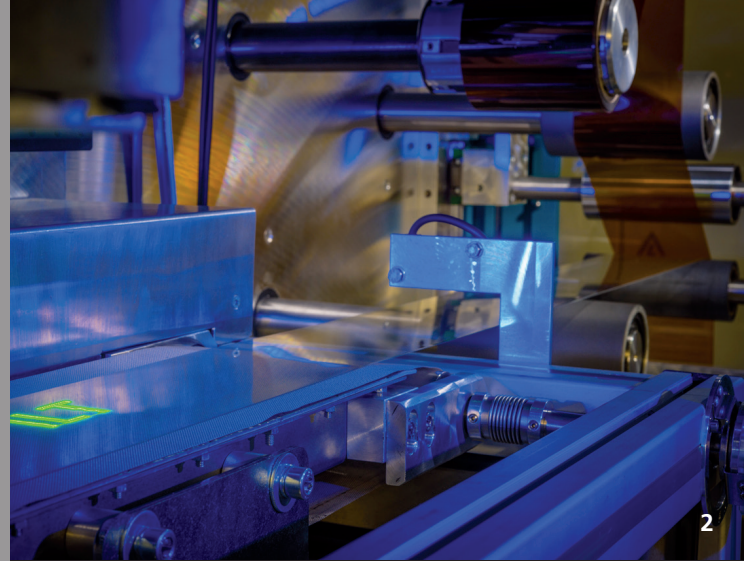




1



2

STRUCTURING THIN LAYERS IN A ROLL-TO-ROLL PROCESS

Task

In polymer electronics, products are generally produced in a roll-to-roll process. Cost-effective products can be made for a wide range of applications, since both inexpensive substrate materials as well as highly productive roll-to-roll processes are used. However, conventional patterning methods such as lithography can only be partly transferred to this type of component manufacturing. Today, however, laser-based processes can be used to structure both polymeric and inorganic functional layers as well as increase resolution significantly.

Method

By using high-repetition ultrafast laser sources combined with optical systems for beam guidance and parallelization, Fraunhofer ILT has integrated powerful method components in a roll-to-roll manufacturing system. With customized ablation strategies and temporal and spatial power modulation, it has been able to achieve high process speeds and selective functionalization of thin film systems. The laser processing method has been applied to the line structuring of organic and inorganic photo-absorption layers and is being qualified for the roll-to-roll production.

Result

For continuous laser-based structuring of semiconducting layers in the field of thin-film photovoltaics, a demonstrator plant has been implemented in the roll-to-roll system. By means of adapted optical systems, the production system is able to selectively process materials at high continuous throughput rates. In connection with the use of a galvanometer, geometrically flexible processing is also possible thanks to the sensory monitoring of the strip material to be processed.

Applications

The findings gained from the thin-film photovoltaics can be transferred to the production of flexible OLED displays, solid-state batteries, electronic circuits, and RFID and sensor applications.

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1 *Inline structure with fixed optics
and scanning unit.*

2 *Roll-to-roll system path.*