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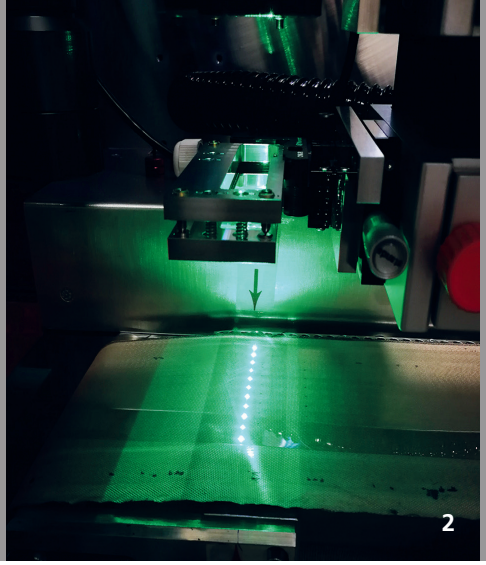
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COST-EFFECTIVE PRODUCTION OF ORGANIC PHOTOVOLTAICS IN A ROLL-TO-ROLL PROCESS

Task

Photovoltaics is one of the supporting columns of renewable energies. In comparison to classic silicon-based photovoltaics, organic photovoltaics shows great promise since, among others, producing them uses resources more economically. Indeed, only a few grams of organic material are needed to produce photovoltaic surfaces that measure a few square meters and are flexible and transparent. In the future, a large number of surfaces will be able to contribute to energy generation through decoratively designed organic solar cells; hence, research and development have focused on producing organic photovoltaics on an industrial scale. Production in a roll-to-roll process without complex vacuum technologies represents a cost-effective key technology to achieve this.

Method

Current findings from the laboratory on the layer structure of an organic solar cell have been transferred to the roll-to-roll process and combined with innovative process technologies. All sub-processes – from coating and cell separation using ultrashort pulsed laser radiation to the encapsulation of the finished solar cell – have been optimized to ensure the most efficient manufacturing process. Inline process analysis and integrated process control complete the implemented system technology.

Results

With belt speeds of up to 5 m/min, thin films with thicknesses between 10 nm and 250 nm have been applied to conductively coated PET substrates. High-precision and innovative laser processes from the short pulse and ultra-short pulse range are used in the sub-steps drying, scribing/separation, decoating and encapsulation. The individual processes are monitored and the overall process is controlled by the built-in sensor technology.

Applications

Organic solar cells can be used in various areas due to their flexibility and transparency. Among the broad spectrum of uses, they can be incorporated into clothing, applied to curved surfaces and installed in interior spaces.

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1 Roll-to-roll plant for the production of organic solar cells.
2 Scribing/separation by means of ultrashort pulsed laser radiation.