Reducing ecological footprint of OPV production

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Solliance - a cross-border research initiative on thin film photovoltaics by ECN, Holst Centre, imec, TNO, TU Eindhoven and FZ Jülich - has achieved a world first with a new inkjet printing process for manufacturing environmentally friendly OPV cells that deliver benchmark efficiency. Completely compatible with existing manufacturing technology, the process replaces toxic chlorinated solvents with more benign alternatives. The result builds on a combined achievement of Solliance and French OPV manufacturer DisaSolar, and was also supported by the EU FP7 project X10D.

Organic photovoltaics (OPVs) promise cheaper solar cells that can be flexible, lightweight, semitransparent and easily integrated into construction materials. Until now, however, OPV production processes have relied on spin-coating techniques and chlorinated solvents. These solvents are highly toxic; their potential for contaminating the water in rivers and killing wildlife making them a banned substance for industrial manufacturing processes. OPVs have so far been limited to lab-scale production.

Under its goal to eliminate toxic substances from production, Solliance has developed a new OPV process that allows the photo-active layers to be inkjet printed without using poisonous chlorinates. The breakthrough was achieved in collaboration with French OPV manufacturer DisaSolar and within the framework of the European project X10D.

The 'magic' behind the process is a blend of low-toxicity solvents. They

provide a stable base that achieves the right level of viscosity and surface energy of the inks, allowing OPVs to be printed. The resulting OPV cells deliver performances comparable to the spin-coated counterparts from standard chlorinated solvents, both achieving approximately 3% efficiency for a P3HT:PCBM photoactive layer system.

Next to being environmentally friendly Solliance's solution also benefits from being based on inkjet printing, making it more suited to scaling up to commercial production. The process uses industrial print-heads, so cells are created in a single pass making production very fast.

"By combining a more environmentally friendly process with large area inkjet printing capability, we have successfully bridged the gap between academia and industry," explains Tamara Eggenhuisen, research scientist in Solliance's Organic Photovoltaics program.

"Apart from the speed and ecological advantages, using ink jet printing allows cells of any shape to be printed. As a result, OPV cells and modules could be fully integrated into building materials and other applications, adding invisible solar generation functionality for perfect environmental aesthetics," adds Jan Gilot, senior research scientist in Solliance's Organic Photovoltaics program.

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