High-speed inkjet printing for organic photovoltaic devices

What is inkjet printing?
In this regard, inkjet printing has emerged as a particularly attractive approach, allowing high-throughput, personalization and cost-efficient production of electronic devices.

Are organic photovoltaics suitable for high-speed optical data receivers?
We show that organic photovoltaics (OPVs) are suitablefor high-speed optical wireless data receivers that can also harvest power. In addition,these OPVs are of particular interest for indoor applications,as their bandgap is larger than that of silicon,leading to better matching to the spectrum of artificial light.

What is a fully inkjet-printed device?
In terms of architecture, the fully inkjet-printed device consists of Ag as the bottom electrode, SnO 2 as the hole-blocking layer, P3HT:IDTBR as the BHJ active layer, and poly (3,4-ethylenedioxythiophene) polystyrene sulfonate (PEDOT:PSS) as the top transparent electrode.

How is inkjet printing used in optical sensing?
In optical sensing,inkjet printing has been utilized to fabricate state-of-the-art organic photodiodes(OPDs) with comparable properties to their inorganic counterparts 6,7,8,9,10.

What printing technologies are used to fabricate high-efficient OSCs?
Herein,in this review,the recent progress and applications of several popular printing technologies to fabricate high-efficient OSCs are summarized,including blade-coating,slot-die coating,gravure printing,screen printing,inkjet printing,etc. The strengths and weaknesses of each printing technology are also outlined in detail.

What is a photovoltaic system?
This dual function of photovoltaic (PV) systems is beneficially exploited for a wide variety of applications ranging from self-powered long-range free-space optical systems, where a large receiver exhibits significant advantages, to self-powered wearable devices as part of the future IoT 15.

Inkjet printing is considered a promising technique for industrial production of Organic Photovoltaic (OPV) devices, especially due to its minimal consumption of materials, the easy modification of the numerical design and because this is a non-contact process. The objective of this study is to make efficient modules at a semi-industrial scale using 128 nozzle heads. In ...

In addition to the materials aspect, many organic semiconductors can dissolve in common organic solvents, allowing various solution-based low-cost fabrication techniques, such as inkjet printing (IJP), 11, 12, 13 screen printing, 14, 15 gravure printing, 16 and meniscus-based methods. 17, 18, 19 The solution-processed

organic electronic devices significantly reduce the ...

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In recent years, organic solar cells became more attractive due to their flexible power devices and the potential for low-cost manufacturing. Inkjet printing is a very potential manufacturing technique of organic solar cells because of its low material usage, flexibility, and large area formation. In this paper, we presented an overall review on the inkjet printing ...

The use of inkjet printing has been extensively implemented in the field of organic field effect transistors [49-56] and organic light emitting diodes [49, 57-59], but only little work is found on inkjet printed organic photovoltaics [44, 60-64]. The application of the inkjet printing technology as a fabrication tool for organic devices ...

The most prominent digital printing technique utilized for the fabrication of a variety of organic electronic devices is inkjet printing. In this technique, the designed layout is formed by a 2D pattern of ink droplets, which are ejected from the nozzles of a printhead (see figure 6(a)). The pattern is typically calculated by the printing ...

In addition, the high speed of image printing leads to a lower resolution of CIJ. ... Self-powered ECDs have been demonstrated via IJP and integration with photovoltaic devices. Yu et al. inkjet-printed TiO 2 /WO 3 ... organic photovoltaics. 156 Similar ink formulation was also adopted for IJP on flexible ITO/PET substrate to obtain ECDs that ...

This high photovoltaic performance indicates the potential of inkjet printing for the mass production of organic photovoltaics. Experimental The devices were built on transparent indium tin oxide (ITO) coated glass substrates, purchased from TFD.

The exploration and optimization of numerous mixed perovskite compositions are causing a strong demand for high-throughput synthesis. Nevertheless high-throughput fabrication of perovskite films with representative film properties, which can efficiently screen the perovskite compositions for photovoltaic applications, has rarely been explored. A high-throughput inkjet ...

with standard coating and printing processes. Printing or coating techniques like screen, inkjet, offset, gravure, slot die, spray and ot hers are being established and demonstrated for organic photovoltaic (OPV) devices on lab scale. The next step is to transfer the lab scale know-how to industrial roll-to-roll production .

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about organic photovoltaic (OPV) cells without halogen and ITO and also the viability of roll to roll ... using this printing method the printing pattern can be easily changed with a printing speed as high as 1000 m2/h [6]. For organic devices, the use of inkjet printing technology is exceptionally encouraging because of the compatibility with ...

Novel emerging materials for organic solar cells, such as nonfullerene acceptors, are paving the way for commercialization of organic photovoltaics. Their utilization in unconventional applications, such as conformable and disposable electronics, has turned the focus to inkjet printing as a fabrication method with advantages including low material usage, rapid digital ...

Välimäki et al. Nanoscale Research Letters (2017) 12:117 DOI 10.1186/s11671-017-1871-9 NANO EXPRESS Open Access Custom-Shaped Organic Photovoltaic Modules--Freedom of Design by Printing M. Välimäki*, E. Jansson, P. Korhonen, A. Peltoniemi and S. Rousu Abstract Freedom of design that was introduced as organic photovoltaic (OPV) modules were fabricated by printing.

Inkjet printed silver nanowire network as top electrode for semi-transparent organic photovoltaic devices Hui Lu; Hui Lu Printable Electronics Research Centre, ... The nozzle clogging during inkjet printing was eliminated by adding high boiling point EG into the Ag NW ink to reduce the ink evaporation in the print head. 18 Fig. 1(a) ...

To demonstrate their potential usage in customized applications, large-area devices are fabricated in the shape of a marine turtle with 4.76% efficiency, showcasing the versatility of the inkjet-printing process for efficient ...

The low cost of organic starting materials and ease of their fabrication processes have propelled the development of various organic devices and have also generated a considerable research interest in the scientific community. These devices make use of organic materials in the form of dielectrics, conductive polymers, or small organic molecules deposited mainly on flexible ...

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1 Introduction. Hybrid organic-inorganic perovskite solar cells (PSCs) have emerged as promising photovoltaic (PV) candidates for commercialization and have attracted significant attention owing to their high light-to-electricity power conversion efficiency (PCE), low-cost fabrication, and flexible mechanical properties.[1-4] Perovskites have a general chemical formula of AMX 3, in which ...

Modern inkjet applications are versatile, ranging from common desktop printers to high-throughput industrial machines for textile, label, poster, or ceramic printing and many more. In order to suit the different requirements of this multitude of applications, several types of inkjet machines were created [30], [31], [32] .

Spray-coating has been widely investigated in organic photovoltaic devices ... consider the inkjet printing process as the most promising technique for further application in large-scale perovskite devices. Inkjet printing could precisely control the droplet size and the trajectory, and has the virtues of a precise patterning ability and ...

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