Researchers make indoor light energy breakthrough for wearable health sensors

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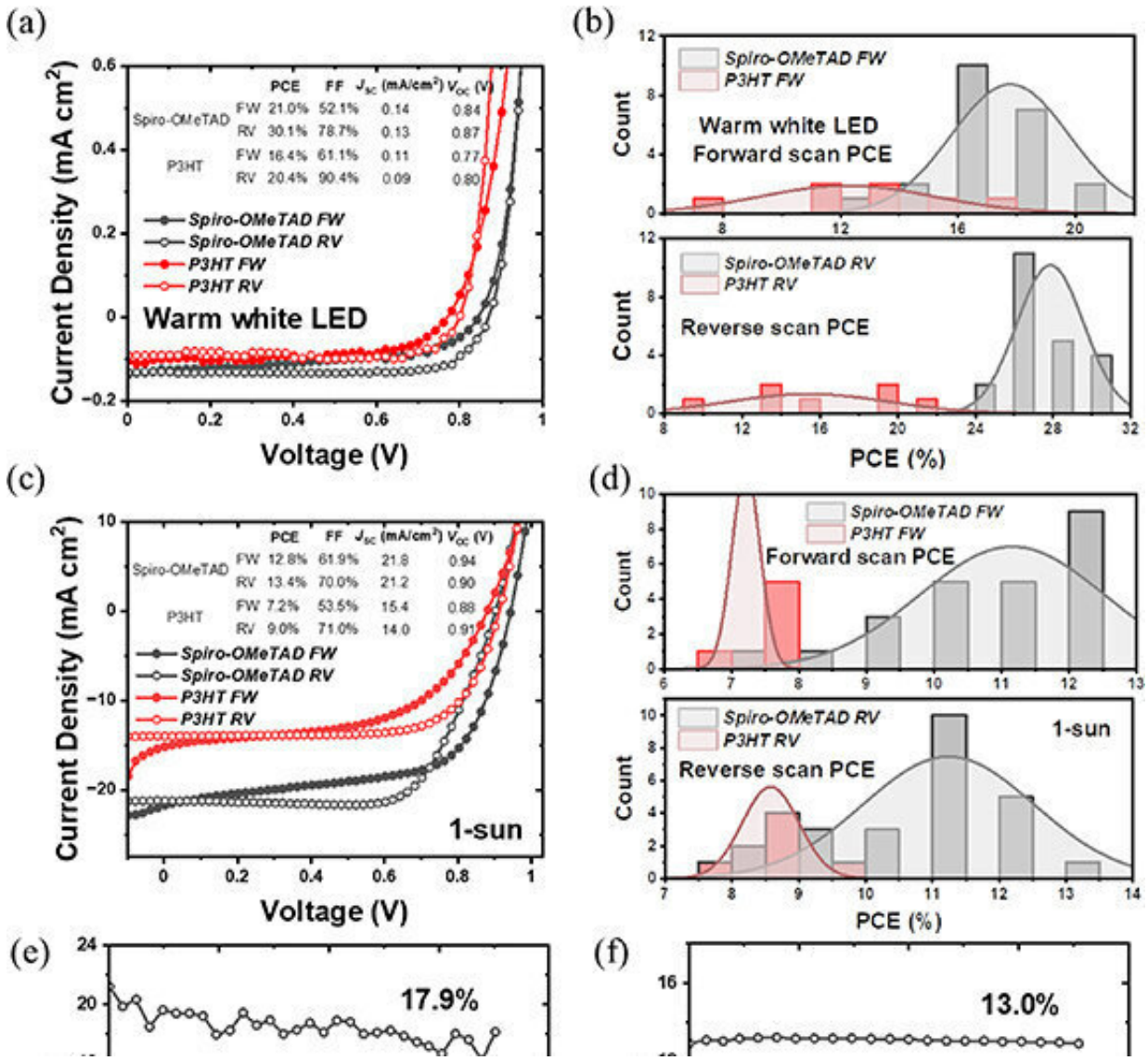

(a) Champion J–V curves of Spiro-OMeTAD and P3HT HTL-based devices under warm white LED illumination. (b) The statistical distribution of PCE

values of Spiro-OMeTAD and P3HT devices under 1000 lux warm white LED light. (c) Champion J–V curves of Spiro-OMeTAD and P3HT based devices under 1 sun illumination. (d) The statistical distribution of PCE values of Spiro-OMeTAD and P3HT devices under 1 sun. (e) Maximum power point tracking PCE comparison of Spiro-OMeTAD and P3HT devices under warm white LED illumination. (f) Maximum power point tracking PCE comparison of Spiro-OMeTAD and P3HT devices under 1 sun condition. Credit: *Journal of Physics: Materials* (2023). DOI: 10.1088/2515-7639/accaaa

Researchers at the University of St Andrews have made significant progress towards powering wearable health sensors through indoor artificial light energy.

A team from the University's Energy Harvesting Research Group at the School of Physics and Astronomy collaborated with colleagues at Kwangwoon University, Korea, on a study that shows how energy from ambient light sources such as white LED and fluorescent lamps can be harnessed through an indoor solar cell to self-power a motion sensor.

The Internet of Things (IoT) is a rapidly growing industry, with projections estimating that it will reach between $5.5 trillion to $12.6 trillion by 2030. The IoT's potential to improve the quality of human life has led to its adoption in several sectors, with the healthcare industry being one of the most promising.

The Internet of Wearable Things (IoWT) is a technology that has the potential to revolutionize the healthcare industry by automating telehealth treatments. Wireless sensors connected to wearable devices continuously monitor human activity and health factors, and collect data, giving clinicians remote access to their patients.

Dr. Lethy Krishnan Jagadamma, who led the research for the University

of St Andrews, said, "Currently, wireless sensors are powered by batteries which often causes interruptions in data collection and patient monitoring due to the battery recharge required or battery replacement. Often the size and heaviness of the battery cause discomfort to patients. So there is a need to find an alternative source of powering the wireless sensors."

By developing indoor solar cells capable of self-powering motion sensors, the group has made significant progress towards powering wearable health sensors with indoor light energy. This breakthrough research could have far-reaching implications for the health care industry, eliminating the need for external power sources and increasing the flexibility and scalability of these devices, leading to a more efficient and uninterrupted system for patient monitoring.

Lead author Dr. Shaoyang Wang said, "I am really happy to achieve this work, as we can combine fundamental insights with device applications. Understanding microcosmic physics and employing the corresponding knowledge in real-life is critical for both researchers and industry."

"We can create great collaborations with people from different fields, make efforts on new products with new concepts and finally, make our life better. This study employs the indoor photovoltaic device from our Energy Harvesting Research lab as the power source to operate a mini sensor, which is an innovative step towards the intelligent Internet of Things application."

Dr. Krishnan Jagadamma said, "Our research group is dedicated to developing innovative materials and devices that can harness energy from ambient sources. The development of indoor solar cells capable of powering motion sensors is a significant step that has the potential to revolutionize the health care industry."

The paper is published in the *Journal of Physics: Materials*.

More information: Shaoyang Wang et al, P3HT vs Spiro-OMeTAD as a hole transport layer for halide perovskite indoor photovoltaics and self-powering of motion sensors, *Journal of Physics: Materials* (2023). DOI: 10.1088/2515-7639/accaaa

Provided by University of St Andrews