**Simple fabrication of flexible perovskite solar cell with enhanced efficiency and stability under ambient air**

Wei-hsiang Chena,b, Linlin Qiub, Zhishan Zhuangb, Lixin Songb, Pingfan Du\*b, Jie Xiong\*a,b, Frank Koc

*aKey Laboratory of Advanced Textile Materials and Manufacturing Technology, Ministry of Education, Hangzhou 310018, PR China*

*bSilk Institute, College of Materials and Textiles, Zhejiang Sci-Tech University, Hangzhou 310018, PR China*

*cDepartment of Materials Engineering, University of British Columbia, Vancouver, Canada*

\*Corresponding authors. Tel.: +86 571 86843586; fax: +86 571 86843603.

*E-mail addresses*: [dupf@zstu.edu.cn](mailto:dupf@zstu.edu.cn) (P. Du); jxiong@zstu.edu.cn (J. Xiong).

**Abstract**

In order to increase the applicability and commercialize of perovskite solar cells (PSCs), simple fabrication of high-photovoltaic-performance flexible PSCs with excellent moisture stabilities without the use of a glove-box and an antisolvent is required. In this paper, we present a simple fabrication strategy involving introduction of 4-tert-butylpyridine (tBP) into CH3NH3PbI3 and significantly enhancing tBP morphology-modification effect via a reduction-active flexible poly(3,4-ethylenedioxythiophene):poly(styrenesulfonate) (PEDOT:PSS) interlayer. Owing to the specific oxidation facilitation by the PEDOT:PSS polymer, a perovskite film with large (~1 µm) and quasi-all-in-one-structured grains can be obtained, which significantly enhance the efficiency and the stability of the PSC. Furthermore, the high-efficiency flexible PSC fabricated by the simple strategy exhibit an excellent moisture resistance owing to the stronger coordination and the outside-covering effect of the hydrophobic tBP. The fabrication can be carried out under ambient air (without glovebox, relative humidity > 40%), which paves the way for wearable device application and commercialization.

