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Perovskites based printable and scalable photovoltaic technology

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Abstract

Among various device designs of perovskite solar cells (PSCs), carbon back contact electrode based mesoscopic perovskite solar cells (CPSCs) offer clean room free production, abundant availability of integrated materials, scalability and inspiring stability in different simulated and natural environmental conditions [1-5].

I have been developing this promising solar cell technology and have been involved in its scaling up in collaboration with academic and industrial partners. In my talk, I will present and discuss the interesting results related to this solar cell technology about: **1.** The replacement of manual infiltration of perovskite precursor ink with automated inkjet infiltration method, which significantly improved the photovoltaic performance reproducibility [1]. **2.** First ever demonstration of exceptional stability of these CPSC under intense UV light illumination [5]. **3.** A breakthrough discovery regarding perovskite crystals growth in the thermo-humid environment, which was observed in an automated humidity chamber and consequently contributed for a drastic improvement (> 50%) in the solar-to-electrical conversion efficiency as well as **4.** Our proceeding steps towards scaling up this low-cost solar cell technology over 20 x 20 cm^2 FTO-Glass substrates size. Our results provide an opportunity to realize low-cost PV factories as decentralized energy production units in each EU country, contrary to highly expensive Si-PV counterparts.

References

[1] Hashmi, Ghufran., David Martineau., Michael Grätzel et al., Air processed inkjet infiltrated carbon based printed perovskite solar cells with high stability and reproducibility, Advanced Materials Technologies 2016, 1600183, 1-6. **[2]** Hashmi, Ghufran., Michael Grätzel et al, High performance carbon-based printed perovskite solar cells with humidity assisted thermal treatment, J. Mater. Chem. A, 2017, 5, 12060-12067. **[3]** A. Mei, X. Li, L. Liu, Z. Ku, T. Liu, Y. Rong, M. Xu, M. Hu, J. Chen, Y. Yang, M. Grätzel, H. Han, A hole-conductor-free, fully printable mesoscopic perovskite solar cell with high stability, Science 2014, 345, 295. **[4]** Y. Hu, S. Si, A. Mei, Y. Rong, H. Liu, X. Li, H. Han, Stable Large-Area ($10 \times 10\ cm^2$) Printable Mesoscopic Perovskite Module Exceeding 10% Efficiency, Sol. RRL 2017, 1, 1600019. **[5]** Hashmi, Ghufran., Michael Grätzel et al., Long term stability of air processed inkjet infiltrated carbon-based printed perovskite solar cells under intense UV light soaking, J. Mater. Chem. A, 2017, 5, 4797-4802.

Biography:



Dr Syed Ghufran Hashmi has recently joined University of Oulu-Finland as Tenure Track Assistant Professor. Before joining Oulu University, he worked in the Department of Applied Physics at Aalto University-Finland for more than a decade in different positions. He moved to Finland in 2007 and completed his Masters in Micro and Nanotechnology from Helsinki University of Technology. After that, he joined New Energy Technologies Research Group at Department of Applied Physics at Aalto University-Finland and completed his doctoral degree in Advanced Energy Systems. His scientific ideas have received nearly 2 ME funding from prestigious funding organizations such as Academy of Finland and Business Finland. He is presently the author of nearly 30 scientific publications, which has received more than 700+ citations.