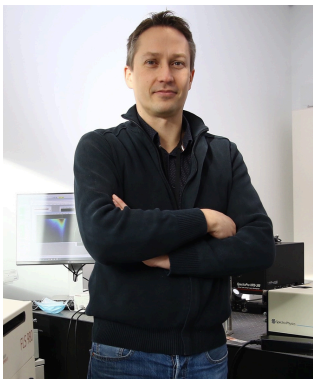
IDENTITY



Frédéric SAUVAGE (CNRS - LRCS, Amiens)

https://www.lrcs.u-picardie.fr/en/

frederic.sauvage@u-picardie.fr

Short Biography

Research Director at CNRS. Joined CNRS in 2010 as a Research Scientist, promoted to Research Director in 2019. Founder and head of the Molecular Photovoltaics and Photocatalysis group at LRCS. Recipient of a 2023 ERC Advanced Grant “GEMINI” Coordinator of H2020 IMPRESSIVE (transparent/colorless PV development), several ANR and industrial projects Co-founder and CTO of G-LYTE since 2019 aiming at development / industrialization of high-performance indoor PV cells for powering consumer electronics. Founder and CTO of CRYSTAL Energy in 2024 aiming at industrializing transparent and colourless PV windows Recipient of Le Point's Innovator Award 2025, REV3 award by ADEME and is currently CNRS Innovation Ambassador. Author/Co-author of 110 publications, 9 patents

Title of Oral Presentation

In situ characterization techniques for understanding degradation in hybrid halide perovskites

Keywords

Lead halide perovskite, stability, photovoltaic, in situ characterization techniques

Abstract of Oral Presentation

Hybrid halide perovskite has established its credibility as high performance thin film photovoltaic technology. In only one-decade, the hybrid organic-inorganic halide perovskite solar cell achieved to compete with all mature crystalline technologies, by reaching a certified 26.7 % power conversion efficiency (PCE) on cells and 20.6 % PCE on small modules. Perovskite's strength stem from their remarkable opto-electronic properties. However, the technology still requires significant attentions regarding stability, in particular rapid structural and electronic degradation can be engendered when exposed to various external stressors (temperature1, humidity2, light3, electrical bias4). To cope with the long-term stability issue, it is a paramount to precisely understand the multiple degradation pathways of the perovskite upon and during the external stressing. To this end, in situ or operando characterization techniques are central tools. In this communication, we will be discussing the degradation of different perovskite composition on the basis of humidity or temperature-controlled in situ x-ray diffraction and corroborated with in situ electron spin resonance spectroscopy and in situ transmission electron microscopy. For example, one key finding which we will discuss is that α-FAPbI3 degradation is substantially accelerated when temperature is combined to illumination and when it is interfaced with the extraction layers, and, second the existence of a temperature gap region which takes place only under illumination involving an intermediate stage between the thermal-induced perovskite degradation and the formation of PbI2 by-product.5

Acknowledgement

Horizon Europe "LAPERITIVO" project under the grant agreement number 101147311, ERC AdG 2023 "GEMINI" under grant agreement 101141284 and ANR MINOTAURE project, Grant # ANR-22-PETA-0015

References

(1) Ava, T. T.; Al Mamun, A.; Marsillac, S.; Namkoong, G. Applied Sciences 2019, 9 (1), 188. (2) Lin, Z.; Zhang, Y.; Gao, M.; Steele, J. A.; Louisia, S.; Yu, S.; Quan, L. N.; Lin, C.-K.; Limmer, D. T.; Yang, P. Matter 2021, 4 (7), 2392–2402 (3) Emelianov, N. A.; Ozerova, V. V.; Zhidkov, I. S.; Korchagin, D. V.; Shilov, G. V.; Litvinov, A. L.; Kurmaev, E. Z.; Frolova, L. A.; Aldoshin, S. M.; Troshin, P. A. J. Phys. Chem. Lett. 2022, 13 (12), 2744–2749. (4)Anoop, K. M.; Khenkin, M.; Di Giacomo, F.; Galagan, Y.; Rahmany, S.; Etgar, L.; Katz, E.; Visoly-Fisher, I. Solar RRL 4 (1900335). (5) Ruellou J., Courty M., Sauvage F., Adv. Funct. Mater. 2023, 2300811