ABSTRACT

The Outstanding Role of Dielectricity in Hybrid Solar Cell Absorbers

D.C. Lupascu1, Young Un Jin1, A. Karabanov1, L.L. Schaberg2, W. Arpavate1,
A. Dubey1, V.V. Shvartsman1, M. Escobar-Castillo1, N. Benson2

1Institute for Materials Science and Center for Nanointegration Duisburg-Essen (CENIDE),
2Institute of Technology for Nanostructures and CENIDE,
University of Duisburg-Essen, Essen, Germany, doru.lupascu@uni-due.de.

The perovskite crystal structure has been hosting a multitude of functionalities discovered over the last seventy years spanning from magnetism, ferroelectricity to supraconductivity. The most recent developments have brought forward hybrid halide perovskites containing a halide ion and a small organic molecule as constituents of the crystal structure. The forerunner material is methylammonium lead iodide. One of the most remarkable properties of these emergent materials is their high charge carrier mobility and an outstanding robustness of the electronic properties towards lattice defects. This is true in 3D as well as 2D systems. While the 3D crystal structures are prone to degradation, the 2D systems are much less so. In this presentation the role of dielectric effects will be displayed covering a very broad frequency range. Paraelectric effects will be contrasted to the role of apparent ferroelectricity, charge disorder and the potential misinterpretation of a number of experiments in this context. The different electronic properties will be put in the general context of dielectricity [1].

[1] I. Anusca, S. Balciunas, P. Gemeiner, M. Sanalialp, G. Lackner, C. Fettkenhauer, J. Belovickis, V. Samulionis, M. Ivanov, B. Dkhil, J. Banys, V.V. Shvartsman, and D.C. Lupascu, Dielectric Response: Answer to Many Questions in the Methylammonium Lead Halide Solar Cell Absorbers, Advanced Energy Materials 7, 1700600 (2017) https://doi.org/10.1002/aenm.201700600