Abstract 24/10/17

Utilizing combinatorial material science and high-throughput analysis as a new method to promote and improve the field of halide perovskites

Adi Kama, Laxman Gouda, Hannah Noa Barad, Shay Tirosh, Arie Zaban*
Department of Chemistry, Center for Nanotechnology & Advanced Materials, Bar-Ilan University

In order to accelerate the process of developing and improving perovskite materials and device structures, a combinatorial synthesis approach with high-throughput analysis techniques is applied. In the combinatorial method we define a library as a single substrate with 169 individual experiments, which are individual solar cells, making it possible to study more materials and gain more knowledge about them. In our lab we adapted all measurements to suit and automatically scan the libraries.

This work focuses on the interface between the electron selective contact, TiO_2, and the perovskite absorbing material, $MAPbI_3$. Throughout this interface, many charge transfer processes occur. Forward movement, injection of electrons in to conduction band of TiO_2, contribute to solar cell photocurrent, as well as some recombination processes that reduce solar cell photocurrent. In order to affect this interface, increase injection of electrons, and reduce recombination rate, different thin insulating oxide layers were applied in between the TiO_2 and the perovskite. By preventing the electrons from going back to the perovskite layer, the recombination rates at this interface were reduced, with the intension of improving solar cell performance. Characterization was performed by high-throughput analysis and combinatorial material science methods.