IMPROVING THE STABILITY OF PEROVSKITE FILMS IN AMBIENT CONDITIONS

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Perovskite solar cells have recently emerged as an attractive renewable energy alternative due to their low production cost and superior efficiency. However, improving the stability of perovskite films remains a major challenge. In particular, one of the factors, accelerating the degradation of the perovskite is its sensitivity to ambient moisture. It makes it difficult to fabricate devices without the nitrogen gloveboxes, because of the increased spread of the results.

In our work, we are testing the strategy of the post-treatment of the perovskite film by spin-coating the carbazole-based phosphonic acid, containing hydrophobic fluorine atoms on top of it. The phosphonic acid fragment is expected to strongly bind to the surface of the perovskite, while the carbazole unit with fluorine serves as protection against moisture. In addition, the presence of a semiconducting unit could potentially have a beneficial effect on the performance of the devices.

The stability of the films was inspected visually, by storing samples at the 20-30 % humidity environment. For the control samples, already after 1 week, complete discoloration happened. On the other hand, for the samples treated with hydrophobic material, the dark brown color remained even after one month of storage. In the continuation of the work the proposed method will be tested in the devices, expecting to see improvements in processability of the perovskite solar cell devices. In addition, more materials will be tested, to elucidate the impact of various substituents on the resilience of the films.