STABILITY ISSUES OF DYE-SENSITIZED AND PEROVSKITE SOLAR CELLS

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Stability is often a key issue to nanoenergy devices, such as nanostructured dye and perovskite solar cells. We present the main issues affecting the stability of these third generation solar cells that could produce cheap solar electricity in future. Dye and perovskite cells can be manufactured with low-cost large-scale production techniques from environmentally friendly materials on a variety of substrates. These properties enable wide application area from indoor consumer electronics to building-integrated photovoltaics.

The main barrier preventing dye and perovskite solar cells from commercializing is stability. There are some promising stability results corresponding to the lifetime of several years under certain environmental stress factors, such as visible light. However, the cells tend to degrade when they are exposed to other stress factors like high temperature, humidity or UV light [1, 2, 3]. This is especially true for perovskite solar cells that are a new cell type reaching remarkable 20 % efficiencies despite of the infancy of the technology.

Even though cell stability is widely in the field regarded as a commercially and scientifically important topic [1][2][3], stability studies are still rare. The aging of the cells is a complex combination of chemical and physical reactions that are partly understood and partly unknown, and during long-term aging tests the nuisance factors accumulate complicating the analysis.

To understand and solve the degradation of the cells, it is essential to further develop the cell characterization and in-situ measurement techniques and standards for stability studies of dye and perovskite solar cells. In this contribution [4], we discuss known and suggested aging routes of the cells, recent successes in the field, and future research techniques that could unveil the degradation mechanisms.