

Using Low Temperature Photoluminescence Spectroscopy to Investigate CH₃NH₃PbI₃ Hybrid Perovskite Degradation

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Investigating the stability and evaluating the quality of the CH₃NH₃PbI₃ perovskite structures is quite critical both to the design and fabrication of high-performance perovskite devices [1] and to fundamental studies of the photophysics of the excitons. In particular, it is known that, under ambient conditions, CH₃NH₃PbI₃ degrades producing some PbI₂ [2]. We show here that low temperature photoluminescence (PL) spectroscopy is a powerful tool to detect PbI₂ traces in hybrid perovskite layers and single crystals [3]. Because PL spectroscopy is a signal detection method on a black background, small PbI₂ traces can be detected, when other methods currently used at room temperature fail. Our study highlights the extremely high stability of the single crystals compared to the thin layers and defects and grain boundaries are thought to play an important role in the degradation mechanism (Fig. 1).

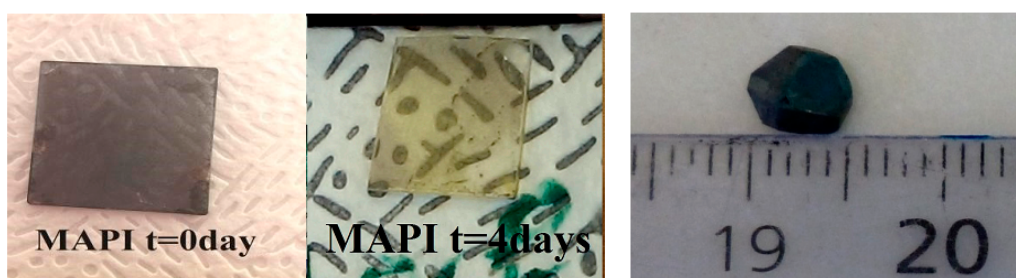


Figure 1 Photographs of a 800 nm thick CH₃NH₃PbI₃ layer deposited by spin-coating on a quartz substrate, just after the deposition (left) and 4 days after the deposition (middle). (Right) Photography of a millimeter sized MAPI crystal, 6 months after its growth.

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[2] J. Yang, B.D. Siempelkamp, D. Liu, T.L. Kelly, *ACS Nano*. **9**, 1955-1963 (2015)

[3] K. Jemli, H. Diab, F. Lédée, G. Trippé-Allard, D. Garrot, *Molecules*. **21**, 885 (2016)

The project leading to this application has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 687008 (GOTSolar).