Deposition of methylammonium iodide: Via evaporation-combined kinetic and mass spectrometric study - DTU Orbit (17/08/2019)

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Methylammonium lead halide perovskites have recently emerged as a very attractive and versatile material for solar cell production. Several different perovskite fabrication methods can be used though most of them involve either spin coating, evaporation under high vacuum or a combination hereof. In this study we focus on thermal evaporation of methylammonium iodide (MAI), or more specifically, why this process, in terms of a physical vapour deposition, requires such a high deposition pressure to be successful. We use quartz crystal micro balance (QCM) measurements as well as mass spectrometry. The results indicate that MAI has a very low sticking especially if the substrate is held at elevated temperatures and is furthermore observed to evaporate with disproportionation into primarily CH₃NH₂ and HI. Even when PbCl₂ is deposited on the QCM crystal, so that CH₃NH₃PbI(3-x)Clₓ perovskite can form, the MAI sticking remains low, possibly due to the requirement that both species be present on the film surface at the same time to form the perovskite. The results provide guidelines for designing a perovskite deposition chamber and additionally fundamental information about MAI evaporation.

General information
Publication status: Published
Organisations: Department of Micro- and Nanotechnology, Silicon Microtechnology, Department of Physics, Experimental Surface and Nanomaterials Physics, Technical University of Denmark
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Pages: 29899-29908
Publication date: 2018
Peer-reviewed: Yes

Publication information
Journal: R S C Advances
Volume: 8
Issue number: 52
ISSN (Print): 2046-2069
Ratings:
BFI (2018): BFI-level 1
Scopus rating (2018): CiteScore 3.16 SJR 0.807 SNIP 0.785
Web of Science (2018): Impact factor 3.049
Web of Science (2018): Indexed yes
Original language: English
Electronic versions:
Untitled.pdf
DoIs:
10.1039/c8ra04851g
Source: FindIt
Source-ID: 2439185404
Research output: Contribution to journal › Journal article – Annual report year: 2018 › Research › peer-review