

18<sup>th</sup> International Conference and Exhibition on

# MATERIALS SCIENCE AND ENGINEERING

May 28-30, 2018 Osaka, Japan

## Atomic scale analysis of $\text{CH}_3\text{NH}_3\text{PbI}_3$ perovskite films by scanning tunneling microscopy and X-ray photoelectron spectroscopy

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In recent years, organic-inorganic hybrid perovskite materials have gained an increasing research interest in academia for applications in thin film solar cells, due to increased efficiency (exceeding 22% as of today), high absorption coefficient, low-cost fabrication process and material availability. Among the various types of hybrid perovskites, the  $\text{MAPbI}_3$  ( $\text{CH}_3\text{NH}_3\text{PbI}_3$ ) based solar cell has shown high power conversion efficiency (PCE) but with several obstacles such as thermal instability and hysteresis loss at room temperature. Therefore, commercialization of these solar cells is still a challenge. Understanding and resolving these issues necessitates the investigation of the sample at the atomic scale to determine the underlying fundamental processes. It may be a good idea to add our 2015 JACS paper here as a reference to show the history of such studies. Here, we present the growth and experimental characterization of thin  $\text{MAPbI}_3$  films on Au (111) under ultra-high vacuum conditions (UHV= $1 \times 10^{-10}$  Torr). The films were prepared by thermal evaporation of the precursor molecules MAI and  $\text{PbI}_2$  with a thickness of a few monolayers (approx. 4 nm). We characterize the sample with scanning tunneling microscopy and X-ray photoelectron spectroscopy (XPS) obtaining information about the atomic structure and chemical composition. Our study will provide the basis for further exploration of mixed perovskite materials to study ion incorporation and stability on the atomic scale.

### Biography

Afshan Jamshaid is presently a PhD student in Okinawa Institute of Science and Technology, Japan. He was a Development Engineer of Physics Department in Lahore University of Management Sciences, Pakistan. He has a MS in Nanoengineering, Waseda University Tokyo, Japan and MSc in Electronics, University of Peshawar, Pakistan. He was also a Teaching Assistant, Computer Science Department, Institute of Management Sciences, Pakistan. He is a recipient of many awards like MEXT G30 (Japanese Government) Scholarship for MS in Nanoengineering (2011-2013); Gold Medal in MSc Electronics (2009); Civil Award in Electronics, Government of Pakistan (2003); Gold Medal in Diploma of Associate Engineering Electronics (2003) and Best Electronics Circuit Designer Award, Government of Pakistan (2001).

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