Imaging of Perovskite Photoactive Layer Cross-Section by Atomic Force Microscopy

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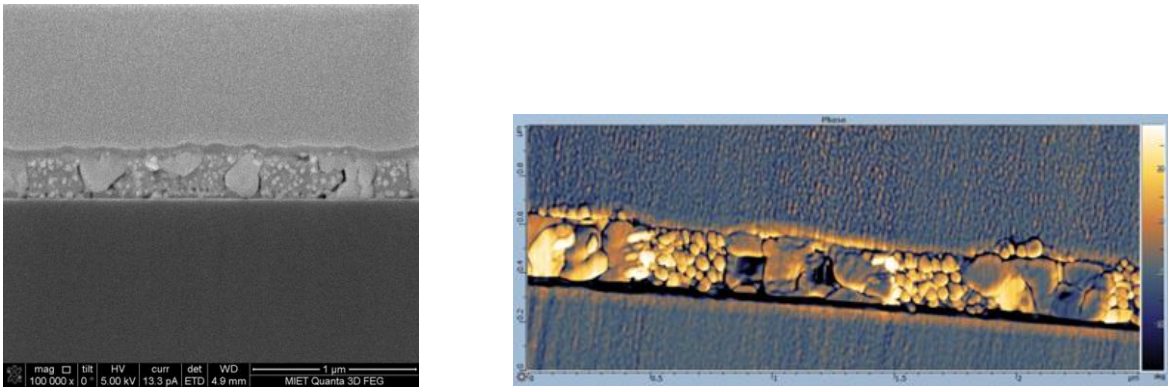
The volume structure of photoactive layer has critical influence on perovskite solar cell performance and life time. In this study the perovskite photoactive layer cross-section was prepared by using Focused Ion Beam (FIB) and imaged by using Scanning Electron Microscopy (SEM) and Atomic Force Microscopy (AFM) methods (Fig. 16). Two different types of perovskite layers were investigated: FAPbBr3 and MAPbBr3. The heterogeneous structure inside film, which consist of large crystals penetrating the film as well as small particles with sizes of several tens nanometers are seen in FAPbBr3 (Fig. 16). The parameters of FIB milling, which allow for preservation of the sample structure, are described. Use of AFM phase contrast provides high contrast imaging of perovskite structure due to strong dependence of oscillating probe phase on materials properties. Comparison of the structure of two compounds explains different crystallization mechanism. The described method can be used for controllable tuning of perovskite structure by changes of sample preparation routes.



a) b)

Fig. 16 Cross-section of FAPbBr3 layer: a) SEM image; b) AFM phase image.

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