

Fabrication of Pure and Doped MAPbI₃ Thin Films by One Step Chemical Vapor Deposition Method for Energy Harvesting Applications

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Abstract : In the present study, we report a facile chemical vapor deposition (CVD) method for Perovskite MAPbI₃ thin films by doping with Br and Cl. We performed a systematic optimization of CVD parameters such as deposition temperature, working pressure and annealing time and temperature to obtain high-quality films of CH₃NH₃PbI₃, CH₃NH₃PbI₃-xBr_x and CH₃NH₃PbI₃-xCl_x perovskite. Scanning electron microscopy and X-ray Diffraction pattern showed that the perovskite films have a large grain size when compared to traditional spin coated thin films. To the best of our knowledge, there are very few reports on highly quality perovskite thin films by various doping such as Br and Cl using one step CVD and there is scope for significant improvement in device efficiency. In addition, their band-gap can be conveniently and widely tuned via doping process. This deposition process produces perovskite thin films with large grain size, long diffusion length and high surface coverage. The enhancement of the output power, CH₃NH₃PbI₃ (MAPbI₃) dye films when compared to spin coated films and enhancement in output power by doping in doped films was demonstrated in detail. The facile one-step method for deposition of perovskite thin films shows a potential candidate for photovoltaic and energy harvesting applications.

Keywords : perovskite thin films, chemical vapor deposition, energy harvesting, photovoltaics

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