Title	Recycling Perovskite Solar Cell by Novel Spray Processes
Name	Teepich Houtae
Degree	Bachelor of Science
Faculty	Science
Field of study	Materials Science and Nano Engineeirng
University	Mahidol University
Year	2561
Advisor	Assistant Professor Dr. Pongsakorn Kanjanaboos

Contact address/ phone number: Advanced Technologies for Energy and Sustainability Lab School of Materials Science and Innovation, Faculty of Science, Room SC1-255, Mahidol University, 999 Phuttamonthon 4 Road, Salaya, Nakhon Pathom 73170 Thailand

Abstract

Perovskite solar cells have had rapid growth in their performance and efficiency over just a few years. To achieve high performance, the perovskite absorbers require high crystallinity and good surface morphology. However, the solar cells still ends up as wastes at the end of their life time. The problem is exacerbated by the solar cells' relatively poor stability where perovskite materials ($CH_3NH_3PbI_3$) can be degraded to PbI_2 waste films with heat, humidity, or UV exposure. Boonthum et al developed a technique called repeated cation doping as a recycling process to convert PbI_2 waste films back to perovskite thin films. Further efforts were done to improve PbI_2 waste films prior to the recycling process by spinning low concentration solutions of PbI_2 on top of the waste films to fill in pinholes on the PbI_2 layers, which cause low device performance. The spinning process however has scale-up limitations and is uneconomical as a large portion of the solution is spun off as excess. In this study, a novel spray process was employed to fill in pinholes on PbI_2 waste films. Furthermore, repeated cation doping was further improved, basing on spray process. Spray times, concentrations and annealing parameters were varied to determine the optimal conditions. The newly developed spray processes for recycling enable better film performance and economical uses of materials with scale-up potential.