Increasing of solar cell stability using Br-doped CH$_3$NH$_3$PbI$_3$ perovskite absorber layers

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Abstract: The CH$_3$NH$_3$PbI$_3$ is one of the most widely used and famous lead halide perovskite absorber layer for using in perovskite solar cells. One of the ways to deal with the instability problem of this perovskite structure in environmental condition is bromide doping in this composition. In this work, the structural and optical properties of the bromide doped CH$_3$NH$_3$PbI$_3$ absorber layers were studied as well as J-V characteristics of solar cell devices based on this absorber layer were also measured and analyzed. Photovoltaic parameters of the fabricated solar cell were measured continuously for 162 days. The results of this study showed that even though the bromide-free perovskite devices has the highest PCE (11.65%), but suffer from a significant drop in $PCE$ (86%) during the measured time period. Comparison of the results showed that the lowest rate of efficiency loss (1%) was obtained for the solar cell with a 1:1 molar iodine-bromide ratio with an energy conversion efficiency of 9%.

Keywords: Perovskite absorber layer, Two-step spin coating technique, CH$_3$NH$_3$PbI$_3$,Br$_x$ absorber layers, Perovskite solar cell stability, Hybrid organic-inorganic halide perovskite, Power conversion efficiency (PCE).