Fabrikasi sel surya perovskite x(CH3NH3I3-yBry)+(1-x)PbCl2 dengan metode deposisi kombinasi 1-2 langkah pada lapisan pembawa elektron ZnO nanorod = Fabrication of perovskite solar cells x(CH3NH3I3-yBry) +(1-x)PbCl2 prepared by combining 1-2 step deposition on ZnO nanorods as electron transfer layer

Sri Ramayanti, author

Abstrak

Sel surya Perovskite (PSCs) telah menarik perhatian luas karena kinerja fotovoltaiknya yang bagus. ZnO adalah salah satu lapisan transpor-elektron (ETL) yang banyak digunakan untuk PSCs. Dalam penelitian ini, ZnO nanorods (ZNRs) disintesis pada kaca FTO melalui metode chemical bath deposition (CBD) menggunakan seng nitrat dan hexamethylenetetramine (HMTA) dengan durasi pertumbuhan 120, 150 dan 180 menit pada suhu anil 90oC. Metode kombinasi deposisi 1-2 langkah spin-dip digunakan untuk membuat lapisan perovskite halida campuran untuk menghasilkan lapisan perovskite bebas pin hole dan meningkatkan efisiensi PSCs. Perovskite terdiri dari methylammonium iodide (MA-I), methylammonium bromide (MA-Br), dan lead chloride (PbCl2) dan menggunakan variasi sistematis rasio mol stoikiometri (x) untuk xMAI + Br dan (1-x)) PbCl2. Larutan kombinasi antara xMAI + Br dan (1-x) PbCl2 digunakan sebagai lapisan prekursor untuk menghasilkan lapisan perovskite akhir. ZnO yang disintesis dikarakterisasi menggunakan scanning mission electron microscope (SEM), X-ray diffraction (XRD), and ultraviolet-visible spectroscopies (UV-Vis) sedangkan performa sel surya perovskite dilakukan dengan mengamati hubungan tegangan arus dalam gelap dan di bawah penerangan. Walaupun masih memerlukan peningkatan performa lebih lanjut, metode ini telah berhasil menghasilkan sel surya perovskite dengan efisiensi 7,95x10-5%, 6,39x10-5% dan 9,61x10-5% untuk 0,33(MAI0,26Br0,14)+(0,67)PbCl2, 0,50(MAI0,26Br0,14)+(0,50) PbCl2 dan 0,67(MAI0, 26Br0,14) + (0,33) PbCl2.

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Perovskite solar cells (PSCs) have attracted extensive attention due to their photovoltaic performance. ZnO is one of the electron-transport layers (ETL) widely used for PSCs. In this work, ZnO nanorods (ZNRs) were synthesized on an FTO glass through a chemical bath deposition (CBD) using zinc nitrate and hexamethylenetetramine (HMTA) with different reaction time of 120, 150 and 180 minutes at annealing temperature of 90oC. The synthesized ZnO was characterized using a scanning mission electron microscope (SEM), X-ray diffraction (XRD), and ultraviolet-visible spectroscopies (UV-Vis). One and two-step combined spin-dip coating was used to fabricate mixed halide perovskite films in order to generate free pin hole in the perovskite film and thus to increase the efficiency of PSCs. The perovskite consisted of methylammonium iodide (MA-I), methylammonium bromide (MA-Br), and lead chloride (PbCl2) within a systematic variation of the stoichiometric mole ratio (x) for the xMAI+Br and (1-x)PbCl2 to produce the final perovskite films. The PSC device performance was characterized by observing the current-voltage relation in the dark and under illumination. The performance is yet to be further improved, however, this method has been successfully generating perovskite solar cell with efficiency 7.95x10-5%, 6.39x10-5% and 9.61x10-5% for 0.33(MAI0.26Br0.4) + (0.67)PbCl<sub>2, 0.50(MAI0.26Br0.14) + (0.50) PbCl2 and 0.67(MAI0.26Br0.14) + (0.34) PbCl2 respectively.