

PEROVSKIT MTiO_3 (M= Ca, Sr, Ba) SEBAGAI FOTOANODA SEL SURYA TERSENSITISASI BIKSIN

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INTISARI

Telah dilakukan penelitian perovskit MTiO_3 (M=Ca, Sr, Ba) sebagai fotoanoda sel surya tersensitisasi zat warna alam biksin. Penelitian ini bertujuan untuk membandingkan karakter CaTiO_3 , SrTiO_3 dan BaTiO_3 serta korelasinya sebagai elektroda hibrida sel surya TiO_2 tersensitisasi zat warna alam biksin. Sel surya TiO_2 digunakan sebagai variabel kontrol. Preparasi pelapisan perovskit dilakukan dengan cara membuat larutan setiap jenis perovskit dengan konsentrasi 0,1 M dengan pelarut etanol kemudian ditambahkan dua tetes triton X-100 dan tiga tetes HNO_3 1,4 M. Produk dikalsinasi pada suhu 550 °C selama 2 jam. Material dikarakterisasi dengan *X-Ray Diffractometer* (XRD) untuk mengetahui kristalinitas material, *Scanning Electron Microscope* (SEM) untuk mengetahui morfologi material, analisis SR-UV untuk mengetahui energi celah pita material dan uji I-V untuk mengetahui efisiensi sel surya.

Hasil karakterisasi menunjukkan ukuran kristal rata-rata TiO_2 , CaTiO_3 , dan SrTiO_3 dan BaTiO_3 pada film TiO_2/FTO berturut-turut 60,85; 81,10; 82,40 dan 44,87 nm. Analisis spektra absorpsi UV-Vis menunjukkan nilai energi celah pita TiO_2/FTO , $\text{CaTiO}_3/\text{TiO}_2/\text{FTO}$, $\text{SrTiO}_3/\text{TiO}_2/\text{FTO}$ dan $\text{BaTiO}_3/\text{TiO}_2/\text{FTO}$ berturut-turut 3,20; 3,29; 3,22 dan 3,27 eV. Nilai efisiensi sel surya tertinggi adalah sel surya berbasis $\text{SrTiO}_3/\text{TiO}_2$, kemudian sel surya berbasis TiO_2/FTO , $\text{BaTiO}_3/\text{TiO}_2/\text{FTO}$ dan terakhir $\text{CaTiO}_3/\text{TiO}_2/\text{FTO}$ dengan nilai efisiensi berturut 0,089; 0,058; 0,040 dan 0,035%.

Kata kunci: barium titanat, stronsium titanat, kalsium titanat, biksin dan sel surya.

***PEROVSKITE MTiO₃ (M= Ca, Sr, Ba) AS PHOTOANODES FOR
BIXIN NATURAL DYE-SENSITIZED SOLAR CELLS***

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ABSTRACT

Perovskite MTiO₃ (M = Ca, Sr, Ba) has been prepared as the films used for photoanodes in bixin natural dye sensitized solar cells. This study was aimed to compare the properties of CaTiO₃, SrTiO₃ and BaTiO₃ and their correlation as hybrid electrodes of TiO₂ solar cells sensitized by bixin natural dye. TiO₂ solar cells were also studied as a control variable. The perovskites coating on FTO (F-doped tin oxide) conductive glasses were carried out from a paste made of 0.1 M of the perovskite in ethanol, two drops of Triton X-100 and three drops of 1.4 M HNO₃. The product was calcined at 550 °C for 2 h. The powder precursors and films were characterized by X-Ray Diffractometer (XRD) to determine the crystallinity of the material, Scanning Electron Microscope (SEM) to determine material morphology, SR-UV Vis spectrophotometer to determine the bandgap energy of the materials. The constructed solar cells were then analysed by I-V (current to voltage) tests to determine the efficiency of solar cells.

Based on the XRD data, it is shown that the average crystallite size of TiO₂ film on FTO, CaTiO₃, SrTiO₃ and BaTiO₃ films on TiO₂/FTO film are 60.85, 81.10, 82.40 and 44.87 nm, respectively. The UV-Vis absorption spectra analysis showed the value of the band gap energy of the same films are 3.20, 3.29, 3.22 and 3.27 eV. The order of solar cell efficiency is SrTiO₃/TiO₂/FTO- >TiO₂/FTO- > BaTiO₃/TiO₂/FTO- >CaTiO₃/TiO₂-based solar cells with the efficiency of 0.089; 0.058; 0.040 and 0.035%, respectively.

Keywords: barium titanate, strontium titanate, calcium titanate, bixin and solar cells.