Studi variasi tinggi tabung film TiO2 nanotubes terhadap performa Dye-Sensitized Solar Cell (DSSC) berbasis N719 = The study of tube height variation of TiO2 nanotube on Dye-Sensitized Solar Cell (DSSC) performance based on N719

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Abstrak

Krisis iklim disebabkan oleh ketergantungan manusia akan energi berbahan dasar fosil berdampak pada peningkatan gas CO2 ke atmosfer bumi. Hal tersebut menyebabkan suhu rata-rata global meningkat dan berimplikasi pada bencana alam yang terjadi di seluruh dunia. Maka dari itu diperlukan energi alternatif yang ramah lingkungan dan dapat diperbaharui. Salah satu sumber energi alternatif itu adalah Dye Sensitized Solar Cell (DSSC) Berbasis N719. Pada pernelitian ini disusun perangkat DSSC dengan TiO2-nanotubes sebagai semikonduktor, ruthenium complex dye N719 sebagai fotosensitizer, Platina sebagai elektroda pembanding, dan elektrolit (I-/I3-). Preparasi TiO2-nanotubes dengan metode two-step anodization pada variasi waktu anodisasi 30, 60, 90, 180 menit. Material kemudian dikarakterisasi dengan SEM, XRD, FTIR, UV-VIS-DRS, dan potensiostat. Hasil penelitian tinggi tabung, dye loading, dan efisiensi DSSC pada variasi waktu anodisasi 30, 60, 90, 180 menit secara berurutan tinggi tabung sebesar 5,28 m; 7,61 m; 11,43 m; 9,45 m, dye loading sebesar 67,13 nmol/cm2; 125,44 nmol/cm2; 237,97 nmol/cm2; 207,91 nmol/cm2, dan persen efisiensi DSSC 1,72%; 2,13%; 3,32%; 3,03%. Hasil yang didapatkan menunjukkan nilai optimum persen efisiensi DSSC berbanding lurus dengan tinggi tabung dan dye loading TiO2-nanotubes.

.....Climate crisis caused by human need for fossil fuel energy have an impact on increasing CO2 emission gas into the atmosphere. More than that, disaster linked to the climate crisis has always been part of our Earth’s system but they are becoming more frequent and intense as the world warms due to an increase the Earth’s average temperature. Therefore we need alternative energy that can be renewed as well as environmentally friendly. One of the renewable and green energy is Dye-Sensitized Solar Cell (DSSC) based on dye N719. In this research, The DSSC device fabricated by TiO2-nanotubes as semoconductor, ruthenium complex dye N719 as photosensitizer, Platina (Pt) as counter electrode, and electrolyte solution (I-/I3-). The preparation of TiO2-nanotubes by two-step anodization method followed by anodization time treatment into four variations, these were in 30 minutes, 60 minutes, 90 minutes, and 180 minutes to get highly ordered length of TiO2-nanotubes. These materials were characterized by SEM, XRD, FTIR, UV-VIS- DRS, dan Electrochemical Work Station. The results of tube length, dye loading, and DSSCs efficiency at four variations of anodization time 30 minutes, 60 minutes, 90 minutes, and 180 minutes sequentially are tube length of 5,28 m; 7,61 m; 11,43 m; 9,45 m, dye loading of 67,13 nmol/cm2; 125,44 nmol/cm2; 237,97 nmol/cm2; 207,91 nmol/cm2, dan DSSC efficiency of 1,72%; 2,13%; 3,32%; 3,03%. The results show optimum value of DSSC efficiency directly proportional to tube length and dye loading of TiO2-nanotubes.