ABSTRAK

PENGARUH DAYA *OUTPUT SOLAR CELL* DALAM PENGISIAN BATERAI DAN VARIASI TEGANGAN TERHADAP PRODUKSI GAS HIDROGEN MENGGUNAKAN ELEKTROLIT NaOH

(Natasya Rahma Utami, 2025 : 54 Halaman, 8 Tabel, 13 Gambar, 4 Lampiran)

Penelitian ini bertujuan untuk mengevaluasi kinerja sistem elektrolisis air yang menggunakan energi dari *solar cell* jenis polikristalin dalam menghasilkan gas hidrogen. Sistem ini memanfaatkan energi matahari untuk mengisi baterai, yang kemudian digunakan untuk proses elektrolisis air dengan bantuan larutan elektrolit NaOH (0,5 M). Penelitian dilakukan selama 4 hari, mencakup analisis pengaruh daya *output* panel surya terhadap waktu pengisian baterai, variasi tegangan terhadap volume gas hidrogen, serta pengaruh intensitas cahaya terhadap efisiensi panel. Hasil penelitian menunjukkan bahwa daya *output* panel surya secara langsung memengaruhi waktu pengisian baterai; semakin tinggi daya, semakin cepat waktu pengisian. Namun, peningkatan tegangan tidak selalu menghasilkan volume gas hidrogen yang lebih besar. Volume tertinggi justru diperoleh pada tegangan rendah hingga sedang (4–6 Volt), sementara pada tegangan tinggi (8–10 Volt) efisiensi menurun karena efek *overpotential* dan hambatan akibat gelembung gas. Selain itu, efisiensi panel surya tidak selalu meningkat dengan intensitas cahaya; efisiensi tertinggi (9,91%) tercapai pada intensitas rendah (1394,98 W/m²), sedangkan intensitas tinggi justru menurunkan efisiensi akibat kenaikan suhu panel. Penelitian ini menegaskan bahwa sistem elektrolisis menggunakan *solar cell* memiliki potensi sebagai solusi energi terbarukan yang ramah lingkungan, namun efisiensinya sangat dipengaruhi oleh tegangan, intensitas cahaya, dan kondisi operasional sistem.

Kata kunci: *solar cell*, elektrolisis air, gas hidrogen, NaOH, efisiensi energi, energi terbarukan.

ABSTRACT

THE EFFECT OF SOLAR CELL OUTPUT POWER ON BATTERY CHARGING AND VOLTAGE VARIATION ON HYDROGEN GAS PRODUCTION USING NaOH ELECTROLYTE

(Natasya Rahma Utami, 2025: 54 Pages, 8 Tables, 13 Figures, 4 Appendices)

This research aims to evaluate the performance of a water electrolysis system powered by polycrystalline solar cells in producing hydrogen gas. The system utilizes solar energy to charge a battery, which subsequently supplies electricity for the water electrolysis process using a 0.5 M NaOH electrolyte solution. The experiment was conducted over four days, focusing on the effects of solar panel output power on battery charging time, the impact of voltage variation on hydrogen gas volume, and the influence of light intensity on panel efficiency. The results indicate that the solar panel output power directly affects battery charging time; higher output power results in faster charging. However, increasing the applied voltage does not always yield higher hydrogen gas production. The highest gas volume was achieved at low to medium voltages (4–6 V), while efficiency decreased at high voltages (8–10 V) due to overpotential effects and gas bubble resistance. Additionally, the solar panel efficiency did not consistently increase with light intensity. The highest efficiency (9.91%) occurred at a lower intensity (1394.98 W/m²), while higher intensity led to reduced efficiency due to panel temperature rise. This study confirms that an electrolysis system powered by solar cells has significant potential as an environmentally friendly renewable energy solution; however, its efficiency is strongly influenced by voltage, light intensity, and operational conditions.

Keywords: *solar cell, water electrolysis, hydrogen gas, NaOH, energy efficiency, renewable energy.*