ABSTRAK

Pengaruh Konsentrasi KCl dan Waktu Fermentasi terhadap Kinerja Bio-Baterai Berbasis Limbah Kulit Nanas dengan Penambahan Pasta Aki Bekas

(Meisya Aulia, 2026, 53 Halaman, 23 Tabel, 13 Gambar, 3 Lampiran)

Krisis energi global mendorong pengembangan sumber energi alternatif ramah lingkungan, salah satunya bio-baterai berbasis limbah kulit nanas. Penelitian ini menggunakan metode eksperimen laboratorium dengan rancangan faktorial 5 × 2, yaitu variasi konsentrasi KCl (0%, 2%, 4%, 6%, 8% b/v) dan waktu fermentasi (0 dan 4 hari). Parameter yang diukur meliputi tegangan, arus, daya, pH, kapasitas, dan penurunan kinerja selama 7 hari. Peningkatan KCl hingga 6% meningkatkan kinerja, namun menurun pada konsentrasi 8%. Fermentasi 4 hari meningkatkan tegangan rata-rata 10,2% dan arus 22,3% dibanding tanpa fermentasi. Kondisi optimum diperoleh pada KCl 6% dan fermentasi 4 hari dengan tegangan 2,01 V, arus 4,25 mA, daya 8,54 mW, kapasitas 11,05 mAh, dan waktu nyala LED 2,6 jam pada pH 3,3. Kombinasi fermentasi dan KCl secara sinergis meningkatkan kinerja bio-baterai melalui peningkatan ion H^+ dari asam organik serta ion K^+ dan Cl^- dari KCl. Bio-baterai ini berpotensi dikembangkan sebagai sumber energi alternatif ramah lingkungan berbasis limbah kulit nanas dan aki bekas.

Kata Kunci: Bio-Baterai, Kulit Nanas, KCl, Fermentasi, Pasta Aki Bekas

ABSTRACT

Effect of KCl Concentration and Fermentation Time on the Performanceof Pineapple Peel Waste-Based Bio-Battery with Addition of Used Battery Paste

(Meisya Aulia, 2026, 53 Pages, 23 Tables, 13 Pictures, 3 Appendixs

The global energy crisis has driven the development of environmentally friendly alternative energy sources, one of which is bio-batteries based on pineapple peel waste. This study employed a laboratory experimental method with a 5 × 2 factorial design, consisting of variations in KCl concentration (0%, 2%, 4%, 6%, 8% w/v) and fermentation time (0 and 4 days). Measured parameters included voltage, current, power, pH, capacity, and performance degradation over 7 days. Increasing KCl concentration up to 6% improved performance, but decreased at 8% concentration. Fermentation for 4 days increased average voltage by 10.2% and current by 22.3% compared to without fermentation. The optimum condition was achieved at 6% KCl and 4 days fermentation, producing voltage of 2.01 V, current of 4.25 mA, power of 8.54 mW, capacity of 11.05 mAh, and LED lighting duration of 2.6 hours at pH 3.3. The combination of fermentation and KCl synergistically improved bio-battery performance through increased H^+ ions from organic acids as well as K^+ and Cl^- ions from KCl. This bio-battery has the potential to be developed as an environmentally friendly alternative energy source based on pineapple peel and used battery waste.

Keywords: bio-battery, pineapple peel, KCl, fermentation, used battery paste