ABSTRAK

Sumber energi listrik yang diandalkan untuk mengoperasikan piranti elektronik portabel adalah baterai. Sayangnya, kebanyakan orang membuang limbah baterai sembarangan saat daya listriknya habis, padahal limbahnya termasuk kategori B3. Kondisi tersebut mendorong pemanfaatan bio-baterai dari hasil samping pengolahan makanan populer di Indonesia, yakni tahu. Geliat industri tahu yang berkembang pesat di kota peneliti, Semarang, menghasilkan limbah cair yang dominan terbuang dan mencemari lingkungan. Limbah tersebut didayagunakan sebagai elektrolit baterai karena mengandung CH_3COOH yang dioptimalkan melalui fermentasi, dipadatkan dengan tepung ampas kelapa, dan diperkuat oleh larutan KCl 40%. Penelitian ini bertujuan menganalisis gaya gerak listrik (GGL), penurunan daya listrik dalam rangkaian LED, dan komposisi optimum bio-baterai. Variasi elektrolit terdiri atas komposit fermentasi limbah cair tahu dan tepung ampas kelapa dengan perbandingan b/v (g/ml) berkomposisi 0, 25, 50, 75, dan 100%. Bio-baterai dibuat dengan mensubstitusi pasta baterai ABC tipe AA 1,5 V bekas dengan variasi elektrolit tertentu. Baterai ABC baru turut diuji sebagai kelompok kontrol. Hasil penelitian menyatakan rerata GGL optimal didapatkan oleh BIO-KOTAK komposisi 25% dengan perolehan 1,59 ± 0,03 V. Rerata GGL tersebut sama dengan kelompok baterai kontrol menurut analisis ANOVA. Penurunan daya listrik terbesar juga diperoleh BIO-KOTAK komposisi 25% (13,77; 3,74; 3,64; 2,89; 2,08; 1,4; 1,38 mW). Rata-rata penurunan daya listrik pada masing-masing komposisi bernilai sama menurut analisis Kruskal-Wallis. Penelitian ini sukses memproduksi bio-baterai dengan GGL menyamai baterai komersial melalui BIO-KOTAK pada komposisi optimum 25%.

Kata kunci: bio-baterai, limbah cair tahu, ampas kelapa, GGL, daya listrik.

ABSTRACT

The source of electrical power relied upon to operate portable electronic devices is batteries. Unfortunately, most people carelessly throw away battery waste when the electrical power runs out, even though the waste is classified as B3. This situation encourages the use of bio-batteries from the by-products of a popular food processing industry in Indonesia, namely tofu. The rapidly growing tofu industry in the researcher's city, Semarang, produces liquid waste that is mostly wasted and pollutes the environment. The waste is used as a battery electrolyte because it contains CH_3COOH, which is optimized by fermentation, solidified with coconut dreg flour, and reinforced with 40% KCl solution. This study aims to analyze the electromotive force (EMF), the decrease of electrical power in the LED circuit, and the optimal composition of the bio-battery. The electrolyte variation consists of a composite of fermented tofu liquid waste and coconut dreg flour with a b/v (g/ml) ratio of 0, 25, 50, 75, and 100%. Bio-batteries were prepared by replacing used 1.5V AA type ABC battery paste with specific electrolyte variations. New ABC batteries were also tested as a control group. The results of the study showed that the optimal average EMF was obtained by the 25% composition BIO-KOTAK with 1.59 ± 0.03 V. The average EMF was the same as the control battery group according to the ANOVA analysis. The greatest decrease in electrical power was also obtained by the 25% composition BIO-KOTAK (13.77; 3.74; 3.64; 2.89; 2.08; 1.4; 1.38 mW). The average decrease in electrical power in each composition was the same according to Kruskal-Wallis analysis. This study successfully produced a bio-battery with an EMF equal to commercial batteries through BIO-KOTAK at an optimal composition of 25%.

Keywords: bio-battery, tofu liquid waste, coconut dreg, EMF, electrical power.