# Produksi Biolistrik dan Bioremediasi Limbah Melalui Optimasi Anolit Pada Microalgae-microbial Fuel Cell (MmFC ) Dengan Menggunakan Konsorsium Chlorella vulgaris-Spirulina platensis = Bioelectricity Production and Waste Bioremediation Through Optimization of The Anolyte in Microalgae-microbial Fuel Cell (MmFC) Using The Chlorella Vulgaris-Spirulina Platensis Consortium

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Abstrak

Ketersediaan energi menjadi kebutuhan esensial bagi kehidupan manusia, namun saat ini produksi energi masih bergantung pada konsumsi bahan bakar fosil. Meningkatnya permintaan energi yang disertai dengan menipisnya cadangan bahan bakar fosil, menyebabkan ketertarikan untuk mencari sumber energi terbarukan yang berkelanjutan dan ramah lingkungan. Salah satunya melalui penggunaan sistem berbasis biologis, yaitu Microalgae-Microbial fuel cell (MmFC). Microalgae-microbial Fuel Cell (MmFC) merupakan perangkat biokimia yang memanfaatkan,proses fotosintesis mikroalga untuk mengubah energi matahari menjadi listrik melalui reaksi metabolisme simultan dengan bakteri. Bakteri yang digunakan pada sistem ini dapat berupa kultur murni ataupun kultur campuran yang berasal dari limbah. Berangkat dari kondisi tersebut maka terdapat 2 optimasi yang dilakukan pada penelitian ini, yaitu optimasi jenis bakteri (bakteri indigenous limbah tempe dan bakteri Acetobacter aceti) dan optimasi waktu inkubasi limbah tempe (0 hari, 3 hari, 7 hari, dan 14 hari). Kinerja MmFC pada optimasi jenis bakteri ditinjau berdasarkan power density, sedangkan pada optimasi waktu inkubasi limbah tempe ditinjau berdasarkan power density dan bioremediasi limbah (%penurunan BOD dan COD). Hasil optimasi jenis bakteri, menunjukkan bahwa bakteri indigenous limbah tempe memberikan nilai power density lebih besar daripada bakteri A. aceti (PDmaks = 812,746 mW/m2; PDrata-rata = 438,310 mW/m2). Sementara itu, hasil optimasi waktu inkubasi limbah tempe, menunjukkan bahwa inkubasi limbah tempe selama 14 hari merupakan waktu inkubasi yang paling optimal ( PDmaks = 1146,876 mW/m2; PDrata-rata = 583,491 mW/m2; %penurunan COD = 46,011%; %penurunan BOD = 47,172%)

.....The availability of energy is an essential need for human life, but currently, energy production still depends on the consumption of fossil fuels. The increasing energy demand, accompanied by the decrease of fossil fuel reserves, has caused interest in finding sustainable and environmentally friendly renewable energy sources. One of them is through the use of a biological-based system, namely Microalgae-Microbial fuel cell (MmFC).Microalgae-microbial Fuel Cell (MmFC) is a biochemical device that utilizes the photosynthetic process of microalgae to convert solar energy into electricity through simultaneous metabolic reactions with bacteria. The bacteria used in this system can be pure cultures or mixed cultures from waste. Based on these conditions, there are 2 optimizations carried out in this research, namely optimization of the type of bacteria (indigenous bacteria of tempeh waste and Acetobacter aceti bacteria) and optimization of incubation time of tempeh waste (0 days, 3 days, 7 days, and 14 days). The performance of MmFC on the optimization of bacterial species was reviewed based on the power density, while the optimization of incubation time for tempeh waste was reviewed based on the power density and waste bioremediation (% decrease in BOD and COD). The results of the optimization of the type of bacteria showed that the

indigenous bacteria of tempeh waste showed a power density value greater than that of A. aceti bacteria (PDmax = 812.746 mW/m2; PDaverage = 438.310 mW/m2). Meanwhile, the optimization results of tempeh waste incubation time showed that incubation of tempeh waste for 14 days was the most optimal incubation time (PDmax = 1146.876 mW/m2; PD average = 583,491 mW/m2; % decrease in BOD = 46.011%; % decrease in COD = 47.172%)