

INTISARI

PENGEMBANGAN SENSOR RASA ASIN IMPEDIMETRIK MENGGUNAKAN *INTERDIGITATED ELECTRODE* TERMODIFIKASI MEMBRAN LIPID 1-HEXADECANOL

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Dalam penelitian ini, dilakukan evaluasi rasa asin menggunakan sensor impedimetrik berbasis *interdigitated electrode* yang telah dimodifikasi dengan membran lipid 1-hexadecanol. Untuk meningkatkan selektivitas sensor rasa asin, dilakukan optimasi konsentrasi total lipid/PVC/plasticizer dalam pelarut THF. Larutan yang diuji adalah rasa asin (NaCl), rasa asam (HCl), rasa manis (sukrosa), rasa pahit (*quinine*), dan rasa umami (MSG). Respons impedansi sensor terhadap larutan diukur pada rentang frekuensi 1 Hz - 100 kHz, kemudian dari respons tersebut dilakukan ekstraksi fitur dengan memilih frekuensi yang paling berpengaruh dalam membedakan rasa. Dari ekstraksi fitur diketahui bahwa frekuensi rendah memiliki kontribusi yang signifikan dalam mendiskriminasi rasa, sehingga diambil rentang frekuensi 1 Hz - 108 Hz dengan data impedansi Z real dan Z imajiner untuk dianalisis menggunakan *principal component analysis* (PCA) dan *linear discriminant analysis* (LDA). Analisis tersebut dilakukan untuk mengetahui kinerja sensor membran dalam menyeleksi rasa asin. Skor *silhouette coefficient* NaCl dari hasil analisis PCA masing-masing sensor dihitung dan dibandingkan untuk mengevaluasi kemampuan selektivitasnya terhadap rasa asin. Hasil menunjukkan bahwa konsentrasi membran lipid terbaik untuk pelapisan sensor adalah 9 w/v%, dengan *silhouette coefficient* 0,75 dan akurasi yang diperoleh dari *k-fold cross-validation* menggunakan LDA adalah 100%. Setelah itu, sensor membran lipid yang optimal tersebut digunakan untuk mengukur beberapa variasi konsentrasi larutan NaCl untuk menguji sensitivitasnya, yaitu 0,01 mM - 0,01 M. Hasil penelitian menunjukkan bahwa respons impedansi menurun seiring dengan meningkatnya konsentrasi NaCl.

Kata kunci: sensor rasa, membran lipid, *interdigitated electrode*, impedimetrik

ABSTRACT

DEVELOPMENT OF AN IMPEDIMETRIC SALTINESS SENSOR USING INTERDIGITATED ELECTRODES MODIFIED WITH 1-HEXADECANOL LIPID MEMBRANE

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In this study, an evaluation of the salty taste was carried out using an impedimetric sensor based on an interdigitated electrode that had been modified with a 1-hexadecanol lipid membrane. To increase the selectivity of the salty taste sensor, optimization of total lipid/PVC/plasticizer concentration in THF was carried out. The solutions tested were salty taste (NaCl), sour taste (HCl), sweet taste (sucrose), bitter taste (quinine), and umami taste (MSG). The impedance response of the sensor to the solution was measured in the frequency range of 1 Hz - 100 kHz, then feature extraction is carried out from this response by selecting the most influential frequency in distinguishing tastes. From feature extraction it is known that low frequency has a significant contribution in discriminating taste, so the frequency range of 1 Hz - 108 Hz is taken with impedance data of Z real and Z imaginary to be analyzed using principal component analysis (PCA) and linear discriminant analysis (LDA). The analysis was carried out to determine the performance of the sensor membrane in selecting salty taste. The NaCl silhouette coefficient score from the results of the PCA analysis of each sensor was calculated and compared to evaluate its selectivity to saltiness. The results showed that the best lipid membrane concentration for sensor coating was 9 w/v%, with a silhouette coefficient of 0.75 and the accuracy obtained from k-fold cross-validation using LDA was 100%. After that, the optimal lipid membrane sensor was used to measure several variations of NaCl solution concentration, namely 0.01 mM - 0.01 M, to test its sensitivity. The results showed that the impedance response decreased with increasing NaCl concentration.

Keywords: *taste sensor, lipid membrane, interdigitated electrode, impedimetric*