Title Development of an ethanol biosensor for ready-to-eat food products

Author S. Chen, F.S.J. Wu and J.B.C. Huang

Citation Book of Abstracts, 2004 IFT (Institute of Food Technologists) Annual Meeting and Food Expo, 13-16 July 2004, Las Vegas, Nevada, USA. 321 pages.

Keywords ready to eat; food product; ethanol biosensor

Abstract

Minimal processed produce or contaminated bakery products at low oxygen environment produce objectionable fermentative volatiles, such as ethanol. Use of a biosensor coupled in a package is beneficial for a non-destructive measurement of the deterioration. The objectives of this study were to construct a biosensor to detect ethanol content in a package, then the biosensor label was applied in food packages. The ethanol biosensor was fabricated by impregnation alcohol oxidase, peroxidase, and coloring agent on TLC and/or methyl cellulose films. L, a, b values were determined using a colorimeter, and the total color difference (ΔE) was calculated corresponding to ethanol vapor level. Also, brownness, olfactory properties and cell count were used to determine the quality of food products, and the correlation with ethanol vapor was analyzed. Color change of the reaction was turning from blue to purple, then burgundy, and the responding time of the ethanol biosensor was calculated 30 min for visible difference. The optimal reaction was found at RH% greater than 80%. The total color difference corresponding to ethanol vapor level was determined as $\Delta E=8.37x+85.35$ ($R^2=0.92$) at 4 °C, and $\Delta E= 1.59x+118.30$ ($R^2=0.96$) at 25 °C, where x indicates the ethanol vapor level in headspace ranging from 0.01 °V 0.10%. A standard color label corresponding to specific ethanol vapor level (0.01%-0.1%) was fabricated for the use in food packages. The ethanol vapor levels in packages were with respect to the growth of yeast in cheese cake, and to the extent of brownness in lettuce stored in low-oxygen atmosphere. The sensitivity of the ethanol biosensor was related to ethanol vapor in headspace, storage temperature and exposure length. This ethanol biosensor label functions to rapidly and quantitatively detect ethanol vapor in food packages.