

Multichannel Taste Sensors With Lipid, Lipid Like – Polymer Membranes

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Many investigations are devoted to an artificial taste sensor due to fast growing food market [1-3]. However, it is not easy task since the taste is developed by many substances belonging to five taste classes (sweetness, sourness, bitterness, saltiness and umami) which affect each other [4].

Multichannel taste sensor composed of lipid-polymer membranes has been already proposed and used for discrimination and quantification of the taste of foodstuff such as beer, sake, coffee, mineral water, milk, tomatoes and others [1]. Despite many investigations this sensor was not applied for larger scale.

Therefore, the other taste sensor based on five electrodes containing lipid, lipid like - polymer membranes (ISE) has been proposed [2]. Five different kinds of lipid or lipid like compounds were used in PVC membranes as substances transforming taste information into electric signals: benzyldecyldimethylammonium chloride monohydrate, hexadecylamine, 1-dodecanol, elaidic acid, cholesterol. The first two membrane electrodes are positively charged, meanwhile the others are neutral. Their response was sensitive to bitter (quinine hydrochloride), sour (hydrochloric, citric and acetic acid) and salt (NaCl) substances used as electrolyte solution and not sensitive to sweet agent (sucrose) in the range of concentration from 10^{-1} to 10^{-4} M. The five channel taste sensor was successfully applied for discrimination of different kind of drinks, containing mainly sucrose and quinine hydrochloride (tonics) [2] or sucrose and citric acid (orangeades). It might be even used for quality control of these drinks bounded with the not sufficient amount of carbon dioxide. The stability and reproducibility of all membranes used in potentiometric sensor were examined. The results obtained showed that this sensor was stable during three weeks and reproducible.

In order to improve and simplify sensor construction all-solid-state electrodes (ASSE, [5]) based on lipid, lipid-like-polymer membranes with conducting polymer (PEDOT/PSS) layer were applied. Two kinds of lipid or lipid-like compounds were used in the membrane: positively charged (benzyltrimethyltetradecylammonium chloride, dodecyltrimethylammonium bromide) and neutral (palmitic and stearic acid). This four channel sensor was applied for sour substances recognition. It was found that electrodes responses depend on lipophilic compound-polymer membrane thickness. It was not the case of conducting polymer thickness. This sensor was more sensitive to hydrochloric acid concentration than to acetic and citric acid concentration. However, the stability of ASSE was not good enough and lower than in case of ISE electrodes.

Therefore, despite the simpler construction (no inert solution) than ISE, the ASSE electrodes cannot be applied in taste sensor.

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