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Development of Caffeine Detection Using Taste Sensor with Lipid/Polymer Membranes

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A multichannel taste sensor, i.e., an electronic tongue, with global selectivity is composed of several types of lipid/polymer membrane for transforming information on taste substances into electric signals that are input to a computer. However, the taste sensor has poorer sensitivity to uncharged molecules such as caffeine, a bitter substance, than to charged taste substances. In this study, we developed a taste sensor with higher sensitivity to detect caffeine using a taste sensor with lipid/polymer membranes that are formed with different lengths of alkyl chain of lipid, namely, tetra-*n*-octylammonium bromide (R8), tetrakis-(decyl)-ammonium bromide (R10), tetradodecylammonium bromide (TDAB; R12), and tetrahexadecylammonium bromide (R16). As a result, caffeine more preferably interacted with lipid membranes containing amine compounds than with phosphate lipid membranes. We also found that the electric responses of the lipid membranes to caffeine were associated with the length of alkyl chain of a lipid and amount concentration in the membrane. From these results, we can estimate the composition optimum for enhancing sensitivity to caffeine.

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