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A Highly Sensitive Frequency Change by Odorants in the Electric Oscillation of a Lipid Membrane

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In human olfactory sensation, the threshold concentrations of odorants are much lower than those in conventional odor sensors developed so far. We propose a high-sensitivity odor sensor utilizing electric oscillation of a lipid membrane. The sensor can detect a tiny amount of odorants, e.g., 5×10^{-8} M for β-ionone, which is about one-hundredth to one-thousandth of the threshold concentration reported with conventional sensors.

1. Introduction

Sensing of odorants is indispensable for the food industry, environmental assessment and so on. While there are some odor sensors,[1–3] they are not as sensitive as the human olfactory system.[4] Gas sensors using semiconductors[5] and piezoelectric crystals have also been developed.[6] Whereas these devices offer the advantage of simplicity and low cost, they detect gases like ammonia and hydrogen sulfide down to about 1 ppm.[7] Therefore, more sensitive sensors that can detect a trace of odorants are desired.

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