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Surface Characterization of Insect Olfactory Receptors based Bioelectronic Nose

The ability to express and purify insect odorant receptors (OrXs) and reconstitute them into artificial membranes such as liposomes and nanodiscs has paved the way for their use as recognition elements in biosensors and also to aid in structural and functional experiments. In this study, we have used surface characterization techniques including ellipsometry, quartz crystal microbalance with dissipation monitoring (QCM-D) and electrochemical impedance spectroscopy (EIS) to understand the various properties of an insect odorant receptor (D.melanogaster Or22a) integrated into the lipid bilayers of liposomes when immobilized on a gold surface. Neutron reflectivity studies under three contrasts (D2O buffer, H2O buffer and gold matched water) were carried out at various stages of an Or22a based biosensor fabrication to further investigate the properties of these receptors when covalently attached on gold wafer and also their interaction with an odorant (methyl hexanoate).
These studies confirmed that Or22a/liposomes can be successfully immobilized on gold surfaces while preserving the receptor function as well as maintaining the integrity of the membrane. After the binding of methyl hexanoate to Or22a, EIS indicated a decrease in resistance, QCM-D indicated a decrease in mass, and Neutron reflectivity indicated a decrease in thickness; all of these changes can be related to a structural and/or conformational change in the Or22a protein which will require more detailed investigations in the future.

Topic

Chemistry

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