平成29年度外国人研究者講演会

Designing molecules and tailoring surfaces for *in vivo* determination in the brain

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Abstract：

In vivo analysis of chemical signals is a vital way to study brain functions and brain activity mapping. The detection approach by implanting a microelectrode in a specific brain region can monitor the changes in the concentration of a variety of extracelluar fluid with excellent spatial and temporal resolution, but the promoting requirements for electrode performance greatly obstructs the exploration to the roles of biomolecules playing in the brain. This presentation talks about the essential design principle and criteria to convert chemical/electrochemical reactions into electric signals, in order to satisfy the increasing demands and requirements, including high selectivity, sensitivity, and accuracy, for in vivo analysis of biomolecules in the brain. The recent developments in designing the various functional surfaces such as self-assembled monolayers, gold nanostructures, and the nanostructured semiconductors for facilitating electron transfer of specific enzymes including superoxide dismutase (SOD) are summarized. I will also demonstrate our work how we have synthesized specific recognition molecules to fulfill more requirements for selective detection. Additionally, the electrochemical ratiometric biosensors with current signal output have been constructed to timely rectify the effect of distinct environments and to avoid the biofouling, greatly improving the accuracy of determination of Cu^{2+} in the live brain. This method with built-in element has been extended to biosensors with potential signal output for in vivo analysis of pH. More importantly, the new concept with dual signal outputs has been demonstrated to open up an avenue to simultaneously determining double species in the brain.

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