CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Erika Yang

Project Number
S0632

Project Title
Developing a Novel Flexible MoS2 Biosensor to Detect Lower-Concentrated Biomolecules at the Femtomolar Level

Abstract

Objectives/Goals
The object of this study is to develop a novel flexible MoS2 biosensor to detect very lower-concentrated biomolecules.

Methods/Materials
I successfully fabricate a MoS2 biosensor on polyimide film, a flexible substrate which has great potential applications. The MoS2 biosensors can be used for rapid biomolecule quantification at fM-levels by analyzing the initial slopes of time-dependent response curves. The flexible MoS2 biosensors exhibited a detection limit for biomolecules as low as 50 fM that is about 10,000 times lower concentration than that can be detected by the conventional biosensor like ELISA.

Results
The fabricated MoS2 biosensors can be used for rapid biomolecule quantification at fM-levels by analyzing the initial slopes of time-dependent response curves. The multiple sensors can be utilized to enable quantification of low-abundance biomarker molecules as well as the affinities and kinetics of antibody-mediated binding events. The flexible MoS2 biosensors exhibited a detection limit as low as 50 fM that is about 10,000 times lower concentration than that can be detected by the conventional ELISA method.

Conclusions/Discussion
The MoS2 biosensors can be used for rapid biomolecule quantification at fM-levels by analyzing the initial slopes of time-dependent response curves. The multiple sensors can be utilized to enable quantification of low-abundance biomarker molecules as well as the affinities and kinetics of antibody-mediated binding events. The flexible MoS2 biosensors exhibited a detection limit as low as 50 fM that is about 10,000 times lower concentration than that can be detected by the conventional biosensor like ELISA.

Summary Statement
I have successfully fabricated a flexible MoS2 biosensor that can detect biomolecules with a concentration as low as 50 fM that is about 10,000 times lower concentration than the conventional ELISA method.

Help Received
I have been working on this project for two years at a research laboratory. They trained me on equipment and I had some discussion with them.