Minority University Research and Education Project (MUREP)

Institution: San Francisco State University

City/State: San Francisco, CA

Award Name: MUREP Partnership Learning Annual Notification (MPLAN)

Award Number: N/A

Title: Early Non-invasive Diagnosis of Heart Diseases/ HRP-4: Health and/or disease monitoring capabilities

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Summary:

Coronary heart disease (CHD) is the most common cause of death globally, representing about 15.6% of all deaths in 2015. Various methods have been used to diagnose CHD, including electrocardiogram, non-invasive imaging such as computed tomography angiography and positron emission tomography, and invasive testing with coronary angiography. These techniques either have a high rate of misdiagnosis or require complex procedures and are thus very time-consuming. In this project, we propose to develop a simple non-invasive method for the early diagnosis of CHD based on surface-enhanced Raman scattering (SERS) with nanorods-on-a-mirror.

Raman spectroscopy is a label-free technique with the capability of identifying different (bio)molecules via fingerprint-like spectra and has become an increasingly useful tool in biological sensing. However, spontaneous Raman scattering is typically a rather weak process, limiting the sensitivity of this technique. In this project, we use nanorods-on-a-mirror structures to enhance the Raman signal and enable the detection of platelet-derived growth factor (PDGF)-BB molecules, an important biomarker for CHD diagnosis, with high sensitivity and specificity.