

Early diagnosis of disease is vital if people are to have the best possible chance of recovery and survival. At early stages of disease only trace amounts of disease-specific biomarkers are present in an already complex biological sample like tissue or blood plasma. Detection of these biomarkers is much like finding a needle in a haystack, a level that current diagnosis methods cannot reach. Lifestyle changes associated with urbanization, cigarette smoking, and obesity have substantially increased the number of people exposed to vascular disorders of atherosclerosis and coronary artery disease. Atherosclerosis occurs in young people with increasing frequency and it is a major cause of cardiovascular diseases, leading to heart attack, stroke or even death. Surface-enhanced Raman spectroscopy (SERS) is a perfect tool which is capable of identifying ultra-low levels of disease biomarkers, especially in combination with immunochemical reaction. The project aims to design SERS biosensors to detect trace amounts of disease biomarkers by trapping them in the key-and-lock-model. To achieve this fabrication of advanced nanomaterials is required which must have an ordered shape of shells, stars or honey comb. Next, the designed nanosensors will be evaluated in animal models of human vessel inflammatory diseases.