

Determination of Prostate Specific Membrane Antigen (PSMA) Based on Combination of Nanocomposite Fe₃O₄@Ag@JB303 and Magnetically Assisted Surface Enhanced Raman Spectroscopy (MA-SERS)

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Abstract : Prostate cancer is now one of the most serious oncological diseases in men with an incidence higher than that of all other solid tumors combined. Diagnosis of prostate cancer usually involves detection of related genes or detection of marker proteins, such as PSA. One of the new potential markers is PSMA (prostate specific membrane antigen). PSMA is a unique membrane bound glycoprotein, which is considerably overexpressed on prostate cancer as well as neovasculature of most of the solid tumors. Commonly applied methods for a detection of proteins include techniques based on immunochemical approaches, including ELISA and RIA. Magnetically assisted surface enhanced Raman spectroscopy (MA-SERS) can be considered as an interesting alternative to generally accepted approaches. This work describes a utilization of MA-SERS in a detection of PSMA in human blood. This analytical platform is based on magnetic nanocomposites Fe₃O₄@Ag, functionalized by a low-molecular selector labeled as JB303. The system allows isolating the marker from the complex sample using application of magnetic force. Detection of PSMA is then performed by SERS effect given by a presence of silver nanoparticles. This system allowed us to analyze PSMA in clinical samples with limits of detection lower than 1 ng/mL.

Keywords : diagnosis, cancer, PSMA, MA-SERS, Ag nanoparticles

Conference Title : ICBCSE 2015 : International Conference on Biological and Chemical Systems Engineering

Conference Location : London, United Kingdom

Conference Dates : December 10-11, 2015