Jožef Stefan Institute
Ljubljana, Slovenia
K7 / Department for
Nanostructured Materials

VIRTUAL SEMINAR
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The development of electrochemical biosensor for SARS-CoV-2 virus detection

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The COVID-19 pandemic outbreak is still gradually spreading worldwide, and there is an urgent need to better understand the coronavirus and develop ways to control its spread. Reliable testing is a critical need as it can help prevent spread and allow scientific, life-saving decisions on treatment and isolation of patients that are especially effective in the early stages of spread. We propose the development of an innovative, portable electrochemical microfluidic biosensor platform for rapid, sensitive and specific SARS-CoV-2 virus detection. Detection platforms are fabricated on inexpensive commercial screen-printed-electrodes (SPE)-polyanaline (PANI)-Au NPs conductive matrix, and its surface is immobilized using two different representative receptor elements, antibody (Ab) and angiotensin-converting enzyme 2 (ACE2), which are both specific to SARS-CoV-2 surface spike glycoprotein-S1, that we target. The receptor platforms are integrated into a fully functional biosensing platform able to translate specific covalent interaction of the immobilized Ab/ACE2 with its corresponding specific binding target, i.e., the SARS-CoV-2 surface spike glycoprotein-S1, into a measurable, concentration-dependent electrical signal (by monitoring the electrochemical response of the electrode in the presence of a $[Fe(CN)6]_{3-/4-}$ redox probe). The proposed electrochemical biosensing platform with high specific surface area exhibits high sensitivity and selectivity, and is able to detect spike glycoprotein-S1 at attomolar, or even subattomolar concentration levels. It is easy to use and can be operated by patients themselves using simple samples like saliva. The proposed electrochemical microfluidic biosensor platform will lead to low cost and rapid alternatives to conventional assays (RT-PCR) for testing as the design enables mass production and population-scale screening.

Kindly invited.