Inkjet-printed-based Electrochemical Approaches for Testing of SARS-CoV-2

Jose Marrugo-Ramírez[1]
Andrea Bonini[1], Massimo Urban[1], Giulio Rosati[1], Cecilia de Carvalho Castro e Silva[2], Arben Merkoci[1,3]

[1] Nanobioelectronics & Biosensors Group, Catalan Institute of Nanoscience and Nanotechnology (ICN2), CSIC and BIST, (ICN2), Campus UAB, 08193 Bellaterra, Barcelona, Spain
[2] Graphene and Nanomaterials Research Center – MackGraphe, Campus UPM, 01302-907 São Paulo, SP, Brazil;
[3] ICREA, Institució Catalana de Recerca i Estudis Avançats, Passeig Lluís Companys 23, Barcelona, Spain

arben.merkoci@icn2.cat

COVID 19 pandemic, initially blindly thought of as a flu-like disease, has reshaped our entire lives. Nowadays, 216 countries are being struck down by the disease, reaching up to 123.419.065 people infected, with 2.719.163 reported deaths globally [1]. Current diagnostic technologies, such as PCR, antigen-, and serological tests are not sufficient to outweigh the incidence of the disease [2]. Their main drawbacks are case-to-case variations, specimen-/sample-collection dependence, high cost, required trained personnel, and generation of false-positive results, along with a lack of sensitivity of the rapid serological and antigen tests at the initial stages of the disease [3]. Considering the current limitations in infrastructure and resources, there is an important need to significantly increase the speed of production and testing, as well as the availability and accessibility of cost-effective, reliable, and rapid Point-of-Care (POC) devices, especially in low-income countries.

In this work, we propose a highly scalable fabrication procedure for a nanomaterial-based impedimetric biosensor using only office equipment, such as inkjet printers, and commercially available materials, as well as a low-cost smartphone readout [4]. The silver nanoparticles ink-based electrodes were successfully functionalized with aptamers binding the SARS-CoV-2 spike protein (SP) [5], and able to detect it at very low concentrations, reaching a LOD of 10 nM in synthetic buffer. The biosensor specificity was studied using SARS-CoV-2 nucleoprotein (NP) and bovine serum albumin (BSA). Further studies encompass an adaptation for its use in more complex media. In comparison to the currently available technologies, the ease and scalability of the proposed biosensing technology could allow for a distributed out-of-the-lab fabrication, maximizing and making the biosensors distribution rapid, equal, and capillary for this and future pandemics.

References

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