Proposal of Antibody-Based Biosensor and portable potentiostat as a potential virus detection of COVID

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The spread of the COVID-19 virus is at the pandemic level, and it has become a global problem; this situation leads us to find new ways to control its advance. Moreover, the best way found to stop its advance is to track people infected. The governments had been used molecular techniques such as Polymerase Chain Reaction (PCR) to identify the virus presence in the patients. However, although this is an effective method, the time to obtain the measurement is high. However, some research groups had developed electronic biosensors based on antibodies, which are potentially faster than the molecular ones. An example works like the biosensor developed by [1], which uses electrodes functionalized with antibodies to give a measurement of the Human Papilloma Virus (HPV) presence in a sample. Also, more recent research from [2] presents another antibody-based biosensor for tuberculosis, and [3] shows a biosensor that detects Zika virus-specific antibodies. Finally, with the technology developed by us [4], a portable, low-cost potentiostat which can perform cyclic voltammetry and custom electrodes for the device. This device works at 3,3V, and it is powered by the USB power of the host system. The potentiostat weights about 20g and its dimensions are 4,45 cms of width, 5,34 cms of length, and around 2 cms of height. This device could make cyclic voltammetry at 1.5Vpp at a scan rate of 12 mV/s, it can measure currents from microamperes to a maximum of 10mA, has a UART communication through a USB-Serial converter, and the software refreshes the newly acquired data every 60ms. Additionally, the software allows exporting all data from the applied voltage against the measured current to a .csv file and the corresponding images. Furthermore, the device and electrodes developed by us are fast to manufacture due to the techniques used. Also, portability is a huge advantage as a portable measurement system. On [1], the authors used impedance measurements to detect the presence of the HPV in a sample. These results were achieved by the change of impedance magnitude that occurs when the virus binds to the antibody. We propose that with our device, we could observe similar differences in the CV using an antibody-based biosensor due to the similarity in size between the HPV and COVID-19. Finally, building a biosensor functionalizing the surface with COVID-19 antibodies could allow us to had a fast procedure to test the presence of the virus on the patients, this in addition to actual measurement methods, will allow us to reach more people and to track and identify the infected patients, which will aid to stop the spreading speed of the COVID-19.

REFERENCES

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FIGURES

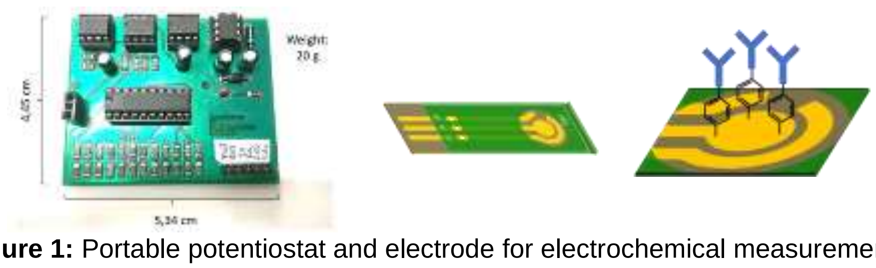

Figure 1: Portable potentiostat and electrode for electrochemical measurements