

## ELECTROCHEMICAL PAPER-BASED ANALYTICAL DEVICES FOR BIOMEDICAL APPLICATIONS

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In the recent years, various new paper-based diagnostic tools have been developed, more commonly known as PADs (Paper-based Analytical Devices)<sup>1</sup>. These kind of devices take advantage of particular features of paper such as porosity and capillarity to perform microfluidic functions without the need of dedicated instrumentation. The most common detection method used in this type of platforms is colorimetry. However, there are different disadvantages related to this detection method, the most relevant one being the limited sensitivity offered by instrument-free observation<sup>2</sup>. In order to increase sensitivity, selectivity and signal quantification, dedicated readers have to be used, which increases both cost and complexity of PADs. Contrarily, electrochemical detection is a more straightforward method towards low cost digital PADs, as it can be fabricated with rapid prototyping techniques and it can be driven with simple instrumentation circuits. However, up to date, not many of these devices are commercially available due several drawbacks such as enzymes stability or limit of detection among others.

This work will explore different paths towards the obtaining of a low-cost digital electrochemical lateral-flow test device for point-of-care applications. In order to obtain the best results, a deep study of the effect of the paper matrix on the electrochemical response of different redox species/substrates typically used in electrochemical immunoassays will be carried out by cyclic voltammetry and chronoamperometry. Furthermore, with the purpose of avoiding the use of enzymes, the electrochemical and spectrophotometrical enzyme-like activity of nanoparticles (NPs) will be assessed.

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