

Self-powered minimalistic biosensors: a lean approach to sustainable single use Point-of-Care devices

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In the last decade, single-use paper-based biosensors have proliferated as the ultimate solution to obtain affordable point of care (POC) diagnostics devices. Departing from commercial paper-based dipsticks (urinalysis dipsticks) and lateral-flow immunoassays (pregnancy tests), materials used in lateral flow devices have been adapted and reconfigured into 2D or 3D paper matrices. This has led to the creation of new and exciting components, for example valves, mixers and separators. In this way, the capabilities of complex microfluidic functions and the simplicity of diagnostic tests strips have been combined to originate a new generation of paper-based analytical devices (μ PADs). These systems have been identified as especially suitable for point of care purposes in the field of home health-care settings and at medical points of care in developing countries. This is because they promise to accomplish the ASSURED criteria; they are affordable, sensitive, specific, user-friendly, rapid and robust, equipment free and derivable to those who need it. Nevertheless, the quantification of the results of a test requires the use of a hand-held reader which, in certain scenarios, is not a cost effective and sustainable solution. In this sense, the re-thinking of Point-of-Care devices in a way that both energy sources and electronic components required to obtain digital results is mandatory. The talk will address the opportunity offered by the implementation of self-powered strategies in point-of-care devices and the minimization of electronic components required to perform the readout. Examples of fully operative devices such as a paper-based conductivity sensor or a screening sensor for diabetes (see Figure 1) will be presented. Ultimately, future diagnostic devices can be compliant with the guidelines of circular economy.

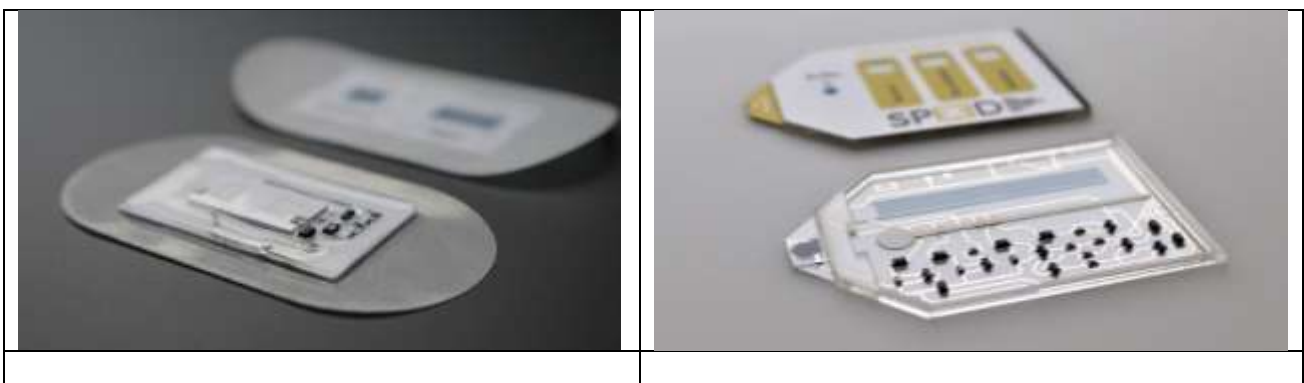


Figure 1. Self-powered patch for sweat conductivity monitoring (left) and self-powered glucometer for screening of gestational diabetes (right)