Integration of Reconfigurable Lab on a Chips for Ad Lib Selection of Biomarkers

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Low cost lab-on-a-chip (LOC) devices may be of application in humanitarian crisis where portable, integrated and versatile systems are essential for fast and in situ multiparametric analyses. Poly(methyl methacrylate) (PMMA) LOCs including silicon based electrochemical transducers (fabricated in cleanroom facilities), presents several advantages such as reproducibility, reliability, durability, reduced size and the possibility of been produced massively. In amperometric biosensors, biomolecules such as enzymes presents the recognition element for further electrochemical detections. These molecules are commonly immobilized nearby the transducer. With a high quality transducer, the durability limitation is presented by the lifetime of the biomolecules, which is often restricted. However, if this sensitive recognition part is refreshed with new and/or different recognition elements, both durable and versatile devices are obtained. In the presented work, an electrodepositable alginate hydrogel is used to immobilize enzymes close to a Pt transducer. After the detection, this membrane can be discarded and a new membrane can be electrodeposited from fresh precursor, using the same transducer. We demonstrate the possibility to quantify glucose and lactate using the same device but different membrane composition, with no need of recalibration and the absence of crosstalk. Additionally, a discrete low cost potentiostat is included, making the device completely portable. The potentiostat shows good versatility (performing cycling voltammetries and chronoamperometries), high resolution (up to 16 bits) and high voltage supply (useful for transducer cleaning). Furthermore, it is size reduced and connectable to smartphones (OTG communication protocol)

for real time monitoring. The designed system presents a wide range of application possibilities also in healthcare, environment pollution control and food industry, where fast and in situ measurements are completely needed.