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Integration of a Sensor System into Microfluidic Chips

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There have been considerable developments in the field of potentiometric sensors in recent years mainly with respect to lowering detection limits and making sensors smaller, solid-state, robust and less expensive.[1, 2] In potentiometric measurements two electrodes are needed, an indicator or ion-selective electrode (ISE) and a reference electrode. However, recent progress in the design and characteristics of the indicator electrodes cannot be exploited without similar progress in the design of the reference electrodes. In this paper we present development of chips with fully integrated solid-contact reference (SC-RE) and ion-selective (SC-ISEs) electrodes. In these electrodes, a conducting polymer (CP) (poly(3,4-ethylenedioxythiophene)) is used as the solid contact ion-to-electron transducer[3]. The conducting polymer is deposited using galvanostatic electropolymerization.[4, 5]

The ability to produce reliable miniaturized reference electrodes, has given us the opportunity to develop several prototype versions of miniature, solid-contact sensor systems (i.e. with fully integrated ion-selective and reference electrodes) that can be further integrated into microfluidic platforms. We have prepared microchips using different designs to test for the best accommodation of the sensors and to optimise the sensor-chip platform characteristics.

Our initial goal is to prepare Pb-ISEs suitable for use as a chemo-sensing component in a widely distributed wireless sensor network (WSN) for monitoring the quality of a fresh water system, together with advanced diagnostics to evaluate the on-going functionality of the sensors using simple electronic signals.[5, 6]

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REFERENCES

1. Radu, A., Peper, S., Bakker, E., D. Diamond, D., Electroanalysis, 2007. 19(2-3): p. 144-154.

2. Diamond, D., 2004. 76(15): p. 278A-286A.

3. Cadogan, A., Gao, Z., Lewenstam, A:, Ivaska, A. and Diamond, D.; Analytical Chemistry, 1992,64, p. 2496-2501;

4 Bobacka, J., Analytical Chemistry, 1999, 71(21), p. 4932-4937.

5. Mattinen, U., Bobacka, J., Lewenstam, A., Electroanalysis, 2009, DOI: 10.1002/elan.200904615.

6. Diamond, D., et al., Talanta, 2008. 75(3): p. 606-612.

6. Diamond, D., Regan, F., Electroanalysis, 1990. 2(2): p. 113-117.