

Implantable pH sensors for monitoring of oral health in the elderly

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Abstract:

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This research is focused on the development of implantable electrochemical-based oral sensors which will monitor oral disease in the elderly (1), by detecting changes in salivary pH and gingival tissue temperature. This paper describes the characterization studies which were carried out on both pH sensors in phosphate buffer solutions and artificial saliva (AS). A salivary pH of between 4.5pH and 7.5pH (2), and gingival temperature between 35°C - 38°C (3), were identified as the target range of interest for the human oral environment. The pH sensors used, were a gold electrode with a pH sensitive iridium oxide (IrOx) layer grown via continuous cyclic voltammetry (4), and an Ion Sensitive Field Effect Transistor (ISFET) probe (5). Sensor measurements were recorded in solutions of varying pH and temperature. An ISFET probe was then implanted into a prototype denture and re-tested in AS, at varying pH levels and temperatures. The implanted ISFET probe responded linearly but at a lower output potential than the non-encapsulated ISFET. Normalisation of the output data could be carried out during signal processing design to account for this error. This study demonstrates the suitability of ISFET and gold electrode pH sensors for incorporation into implantable oral sensors.

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