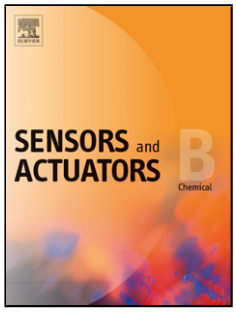

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A flexible Ag/AgCl micro reference electrode based on a parylene tube structure

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Highlights

- A flexible miniaturized Ag/AgCl reference electrode based on a parylene tube structure is demonstrated.
- Stability and life time of the proposed reference electrode are improved by integrating an inner electrolyte reservoir and a Ag/AgCl wire.
- The developed reference electrode exhibits a good stability in different pH buffer and PBS solutions.
- An electrodeposited iridium oxide has been monolithically integrated to demonstrate a miniaturized pH sensor.

Abstract
In the effort of developing micro-electrochemical sensors, the miniaturization of reference electrodes has been a challenging task. In this paper, a flexible micro reference electrode with an internal electrolyte reservoir is reported. This new device is based on a unique microfabricated parylene tube structure, which is filled with Cl^- rich electrolyte, into which a 50 µm diameter silver (Ag) wire covered with a 7.4 µm thick silver chloride (AgCl) layer is inserted. The distal end of the tube is filled with potassium chloride (KCl) saturated agarose gel. The Ag wire, thick AgCl layer, and internal electrolyte reservoir lead to a long operation time and a stable reference voltage. The drift over a 10-hour period has been found to be less than 2 mV. The total operation time of the device has exceeded 100 hours. Furthermore, the compatibility with microfabrication allows the integration of other components, leading to truly miniaturized electrochemical sensors or sensing systems. To prove this, we demonstrated a pH sensor by