Área: ELE

Paper-based microfluidic device for chloride quantification in isotonic drinks using inkjet-printed silver electrodes

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Highlights

A paper-based microfluidic device (μPAD) allowed continuous analyses. Thirty injections were conducted in a single μPAD. Coconut waters and rehydration drinks were analyzed with the μPADs.

Resumo/Abstract

Chloride (Cl^-) represents 70% of the body's anion content and is involved in many cell processes. The deficit or excess of Cl^- can result in health problems, such as early renal failure[1]. This work aims to develop an affordable and easy-to-manufacture μPAD for Cl^- quantification in isotonic drinks. The proposed μPAD is inspired by Flow Injection Analysis (FIA) system. To fabricate this system (Figure 1A), a PMMA plate and filter paper substrate were cut with a laser cutter. Silver electrodes were inkjet-printed with a Dimatix printer[2]. Before use, the indicator electrode was modified with ClO_4^-, converting the Ag to AgCl, which results in an Ion selective electrode (ISE) for chloride[3]. μPAD optimization involved evaluating reservoir volumes, flow path size, injection position and volume, paper type, and PMMA thickness. Calibration curves (0.1–10 mmol L^{-1}) were obtained by increasing and decreasing Cl^- concentrations (Figure 1B), showing a linear response (Figure 1C) according to the Nernst equation (E *vs.* log of the concentration). Next, commercial coconut waters and rehydration drinks were analyzed with the μPAD, yielding chloride concentrations consistent with literature[4] for the coconut water and close to the reported by the manufacturer for the other sample. Therefore, the proposed μPAD showed promising results for accurately quantifying chloride content in drink samples.

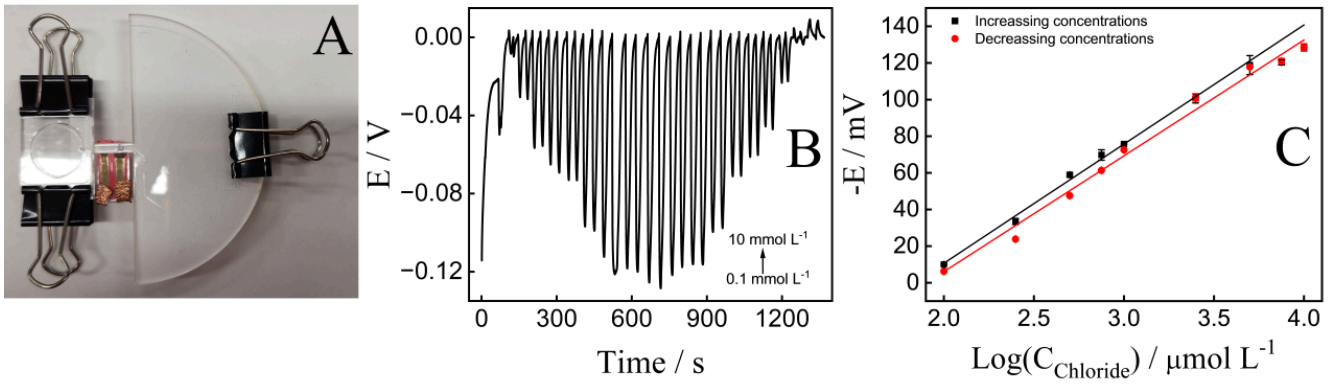

Figure 1 – A) Image of the μPAD, B) Chronopotentiomogram, and C) Analytical curves for chloride.

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