Wearable Chemical Sensing – Optimizing Fluidics for Real-Time Sweat Analysis

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Background

- Monitoring hydration
- Cystic fibrosis treatments


http://design.pepsico.com/gatorade.php?v=19#section2
C⁴D

- Capacitively coupled contactless conductivity detection (C⁴D)
- No biofouling of sensor
CF: $\text{[NaCl]} > 60\text{mM}$

Healthy individuals

Cystic Fibrosis

$y = -2.6865x + 2132.7$
$R^2 = 0.9849$

$y = -0.9208x + 2041.3$
$R^2 = 0.9933$
Injection of varying NaCl concentrations

Au microelectrode voltage vs. time graph using 10 mM NaCl as the eluent and injecting 100µL of (A) 130 mM NaCl and (B) 30, 60, 90 and 130 mM NaCl at a flow rate of 20µL/min. A PMMA microchannel with a surface area over the electrodes of 0.36 mm² was used.
Next steps

• New PMMA channel designs
  – Minimizing fluidic volume
  – Maximizing surface area

• Varying flow rates

• Integration into on-body platform

Glennon, T; O'Quigley, C; McCaul, M; Coyle, S.; Matzeu, G; and Coleman, S; and Ben Azouz, A; Beirne, S; Wallace, G; and White, P; O'Mahoney, N; Diamond, D. (2016) ‘SWEATCH’ – A platform for real-time monitoring of sweat electrolyte composition. In: ACES2016 Symposium, 10-12 Feb. 2016, Deakin University, Melbourne, Australia.
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