Supplementary Materials: Bio-fouling Resistant Impedimetric Sensor Array for High-Resolution Extracellular Potassium Monitoring in the Brain

Ruben Machado, Nima Soltani, Suzie Dufour, Muhammad Tariqus Salam, Peter L. Carlen, Roman Genov and Michael Thompson

Abstract: Extracellular potassium concentration, \([K^+]_o\), plays a fundamental role in the physiological functions of the brain. Studies investigating changes in \([K^+]_o\) have predominantly relied upon glass capillary electrodes with \(K^+\)-sensitive solution gradients for their measurements. However, such electrodes are unsuitable for taking spatio-temporal measurements and are limited by the small surface area of their tips. We propose a novel approach that uses multichannel gold monolayer coated microelectrodes for \textit{in vivo} spatio-temporal measurements of \([K^+]_o\) in the mouse brain.
1. Nuclear Magnetic Resonance (NMR)

Figure S-2: NMR for (II) bis((1,4,7,10,13,16-hexaoxacyclooctadecan-2-yl)methyl) 2-(azidopentyl)malonate.
2. Impedance Measurements

**Figure S-3:** Impedance measurements for: sodium (top), potassium (middle), and calcium (bottom) in simulated cerebrospinal fluid (CSF). Each solution contained: NaCl 120 mM, 10 mM glucose 10 mM, NaHCO₃ 22 mM, NaH₂PO₄·H₂O, MgSO₄ mM and CaCl₂ 2.6 mM. Any compounds containing the cation of interest in the simulated CSF were replaced with a similar cation.
3. X-ray Photoelectron Spectroscopy (XPS)

**Figure S-4**: X-Ray Photoelectron Spectroscopy (XPS) narrow scans for gold microelectrode for carbon. Bare cleaned gold was compared to gold coated with a mixed monolayer of K+ probe and MEG-SH in a 1:10 ratio.