



Presentation Abstract

Program#/Poster#: 390.7/HH15

Title: Improving impedance of microelectrode arrays by ultrasonic electroplating of durable platinum black

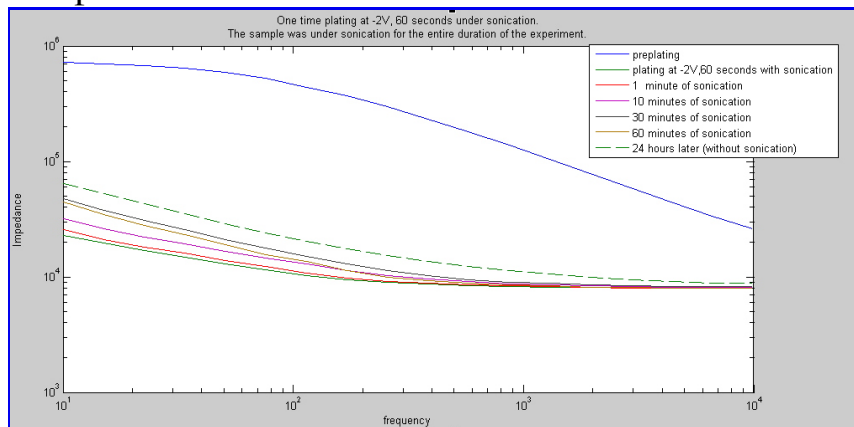
Location: South Hall A

Presentation Time: Monday, Oct 19, 2009, 10:00 AM -11:00 AM

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Abstract: The signal/noise ratio of recordings from microelectrodes is improved by reducing electrode impedance. For microstimulation, a given stimulation current can be passed at a lower voltage if impedance is reduced. This reduces the danger of damage due to electrolysis, and reduces stimulation artifacts. Increasing the size of the microelectrodes reduces impedance, but sacrifices single-unit specificity. Ideally, impedance should be reduced by increasing surface area without increasing the physical extent of the electrode. Electroplated platinum black has a very high surface area but traditionally is very delicate and not suitable for chronic use. We developed a method for electroplating microwire and MEA electrodes with platinum black under ultrasonic agitation that leads to increased durability while reducing their impedance by more than an order of magnitude, with negligible increase in electrode

extent. We used a custom built neural stimulation and recording system (NeuroRighter) for simultaneous electroplating while measuring impedance. Sixty seconds of “sonico-platinizing” brought microwire array impedance at 1 kHz down from ~150kOhm to <10kOhm. Impedance did not rise significantly after an additional 60 min of continuous sonication. MEA culture dishes sonico-platinized by this method maintained good signal/noise of recordings from neurons cultured continuously for 2 years. Microwire arrays retained their <10kOhm impedance after being inserted into model brain tissue with similar Young’s modulus. Comparisons of sonico-platinization with normal and pulsed electroplating of platinum black will be presented. Using high-surface area, compact, durable platinum black coatings should allow better recording and stimulation from microelectrodes, compared to bare metal electrodes.



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Keyword(s): multielectrode array

Impedance

signal-to-noise

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