

UNIVERSITY OF RHODE ISLAND
Department of Chemistry
SEMINAR

Room 105 Beupre Center
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***“Electrochemical Effects of Depositing
Iridium Oxide Nanoparticles onto Flexible
Substrates”***

HOST

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Electrochemical Effects of Depositing Iridium Oxide Nanoparticles onto Flexible Substrates

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Abstract

This presentation reports methods to deposit iridium oxide nanoparticles (IrOx NPs) onto flexible materials for charge storage and ion transport. We deposited IrOx NPs onto conductive substrates via electroflocculation whereby the NPs could retain their individual shape and size. IrOx NPs have four oxidation states, from 3+ to 6+. The focus of the first part of the presentation is the charge storage properties of IrOx NPs. We found that the resulting specific capacitance of the NP deposited materials increased within the range from 192% to 2,747% and was stable for over 1,000 charge and discharge cycles. The focus of the second part of the presentation is the permselectivity properties of the Ir³⁺ and Ir⁴⁺ states of IrOx NPs. We found that, when IrOx NPs are in the 3+ state, small metal ions (i.e., Li⁺, Na⁺, and K⁺) can pass through them when they are deposited onto a conductive material. However, when the IrOx NPs are in the 4+ state, the same small metal ions cannot pass through the material. The electron transfer process between Ir³⁺ and Ir⁴⁺ is reversible, and thus, the permselectivity of an NP deposited material can be fine-tuned electrochemically.