Cover Profile
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Nickel Alloying Significantly Enhances the Power Density of Ruthenium-Based Supercapacitors


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Invited for this month's cover picture is the group of Prof. Raz Jelinek at Ben-Gurion University. The cover picture shows the incorporation of Ni in the RuO_2-based supercapacitor through a simple electrochemical process. Nickel incorporation affected both the morphology and electrochemical performance, particularly enabling operation of the supercapacitor in high current densities and high frequencies. Read the full text of the Article at 10.1002/batt.202000110.

What was the inspiration for this cover design?

When we looked at the cross-section of the NiRu layer for the first time, we thought it looked like a tree. Since then, whenever we discussed the project, we always referred to it as "the NiRu forest". Moreover, our objective is to emphasize that the contribution of the Ni to the electrochemical performance is the most significant finding in this work, underscoring the "vision" of Ru and Ni walking hand in hand. Overall, we wanted to design a cover that will hint on the concept presented in the article and entice readers to read it for a complete understanding.

What was the biggest surprise (on the way to the results presented in this paper)?

When we first thought on incorporating Ni with Ru to fabricate an alloy, we did not expect that Ru from NiRu will behave "independently" and get oxidized to RuO_2 (which is the critical component determining the electrochemical properties of the supercapacitor). Indeed, we were surprised to observe that during the simple electrochemical oxidation process ruthenium is effectively "separated" from Ni in the alloy, undergoing independent oxidation. We believe that this phenomenon is of great importance to the electrochemical performance because it creates an intimate interface between the NiRu and the RuO_2, which is crucial at high power densities.

What other topics are you working on at the moment?

Currently, we are working on expanding our understanding and applicability of the NiRu system towards developing devices that can operate at higher power densities. We explore introduction of additional processes during the electrochemical deposition that may affect the morphology, charge transfer, and energy density. Overall, we aim to develop next-generation, advanced supercapacitors that may operate in high power/energy densities and high frequencies.