Abstract #623, 224th ECS Meeting, © 2013 The Electrochemical Society

Fabricating and Testing 100 F Electrochemical Capacitors: Case Capacitor Prototyping Facility

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Energy storage in electrochemical capacitors is of great interest because of its high reversibility, long cycle life, and safe operation. Global activities continue to develop improved materials offering higher performance and increased durability. However, a testing platform is needed for the new advanced materials and for developing a better understanding of normal degradation processes. We have built the Case Capacitor Prototyping Facility (CCPF) at Case Western Reserve University in Cleveland Ohio to evaluate these advanced electrochemical capacitor materials. Materials are evaluated for their functional performance in nominal 100-F-size, spiral-wound prototype cells, which is a common commercial mid-size product. Carbon electrode materials, electrolyte, separator, additives, and package seal materials can be evaluated using these test vehicles. The facility's equipment and processing capability allows mixing of electrode materials, electrode slurry coating on a foil substrate, roll calendaring, current contact tab attachment, roll winding of coated foils and separator into a bobbin, bobbin drying, electrolyte addition and package crimp sealing under dry conditions, and package labeling. Fabricated prototype devices allow initial electrical property and performance measurements of specific materials or designs as well as the long-term stability and durability testing of construction materials.

Within a few days the Case Capacitor Prototyping Facility is able to produce many tens of nominally identical cells and thus allow collection of statistically significant information to aid in the optimization of advanced construction materials. A goal of the CCPF, in addition to the training of students and supporting fundamental materials and performance research, is to facilitate commercialization of advanced electric double layer capacitor materials by providing functional performance information consistent with general industry needs. We will describe this facility, discuss its capabilities in detail, and present examples of performance information for capacitor devices fabricated using typical commercial materials. We will present results of investigating factors like slurry composition and electrode thicknesses.

Acknowledgements
This Case Western Reserve University facility was funded through a grant from the Ohio Third Frontier Program, Ohio Department of Development, contract number TECH 12-035. This research team also gratefully acknowledges the student help on this project that was provided by Aaron Keith, Valerie Michel, and Elisah Vander-Busch.



Electrode coating machine (left) and bobbin winder (right).


Case Capacitor Prototype Facility lab equipped to fabricate sealed nominally 100-F-size electrochemical capacitors from basic materials.


Electrode coating on aluminum foil substrates with welded electrical contact tabs.


Can, header, and spiral wound electrode-separator bobbin


Can and finished nominally 100 F sealed electrochemical capacitor