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Dey, Ramendra Sundar; Chi, Qijin

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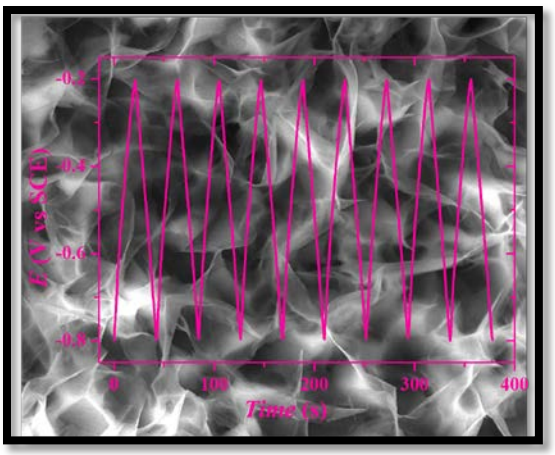
Integrated assembly of 3D graphene networks for construction of all-in-one supercapacitor electrodes

Ramendra Sundar Dey and Qijin Chi*

(* E-mail: cq@kemi.dtu.dk; Phone: +45 45252032)

Department of Chemistry, Technical University of Denmark, 2800 Kongens Lyngby, Denmark

Research picture



Abstract: Supercapacitors are a kind of efficient and safe energy storage and conversion devices. The development of new-generation supercapacitors that can be used in portable electronic devices and in next-generation vehicles is increasingly demanded. This crucially depends on the discovery of more efficient and cost-effective novel materials. Because of their ultrahigh specific surface areas and excellent conductivity, three-dimensional (3D) graphene materials hold great promises for supercapacitors. However, the assembly of graphene building blocks into the supercapacitor electrodes with low intrinsic resistance and high ion conductance is still a challenging issue. In this work, we have undertaken the challenge and used electrochemically generated copper foams (CuF) as an effective template to directly integrate reduced graphene oxide (rGO) 3D networks. This has led to the construction of all-in-one supercapacitor electrodes (3DrGO@CuF) [1]. The overall procedure includes two steps: self-assembly of graphene oxide (GO) on CuF and electrochemical reduction of GO into rGO. The resulting electrodes are capable of delivering a specific capacitance as high as 623 F g^{-1} with high cycling stability. Thus, we have shown that high specific capacitance can be achieved with 3D graphene nanostructures

without any external pseudo-capacitive species doped [2, 3]. The new method is also cost-effective and environmentally friendly.

References

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Portrait image

Mini-CV of the Speaker, Ramendra S. Dey

Dr. Ramendra Sundar Dey is currently a Hans C. Ørsted postdoc fellow under the supervision of associate professor Qijin Chi, at Technical University of Denmark (DTU), Denmark. His current research is focused on the architecture and engineering of graphene materials and their applications in advanced energy technology and sensing devices. He received his both MSc (2007) and PhD (2013) degree in Chemistry, respectively from University of Burdwan and from Indian Institute of Technology Kharagpur, India. During his PhD study, he focused his research on electrochemical sensors and biosensors based on nanostructured metal, metal oxide and graphene materials. He has been doing research as a postdoctoral researcher in the Nanochemistry Group at DTU Chemistry since October 2013, where he has explored the potential of three-dimensional graphene materials for the development of supercapacitors and sensors. He has been honored with a PhD fellowship from UGC, India (2008-2013), the best oral presentation award from ISEAC (2013), several national awards from India and the prestigious Hans Christian Ørsted postdoctoral fellowship (2013) from DTU.