John Collins, Ph.D.

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Surface electrochemist seeking integration with a small, agile team focusing on development of next generation, energy dense storage devices for renewable or mobile applications. Interests in hybrid (asymmetric) energy storage, wet & dry lithium ion battery/capacitor development and integration; on-chip microbattery fabrication, carbon materials synthesis and EV battery focus.

EXPERIENCE

Research Scientist, International Business Machines (IBM)
T.J. Watson Center for Research, (Yorktown Heights, NY) 2016 – current
Microbattery synthesis and engineering; electroplating method development; dry (thin film) and wet battery engineering techniques; microbattery integration with silicon wafer substrates. Cross-team coordination (electroplating, lithography, RIE, etc.); cross-project collaboration—special focus on adhesion, ion-conductivity, conformality/uniformity and additive layer synthesis/method development

Visiting Research Scholar, University of California, Santa Barbara (Santa Barbara, CA) 2015 – 2016
Synthesis characterization of Graphene Quantum Dots for photochemical light conversion
Functionalized graphene oxide synthesis and scale up method development

Postdoctoral Research Associate, Texas A&M University (College Station, MA) 2015 – 2015
Electrochemical and Spectroscopic Analysis of Polymer/Metal Interfaces – industry and military collaborations; Corrosion chemistry; Graphene oxide synthesis - polymer composites; reduced, functionalized graphene oxide for advanced capacitors; *in situ* spectroelectrochemical analysis

Instructor and Teaching Assistant, University of Massachusetts (Boston, MA) 2008 – 2014
Lecture, laboratory and online teaching for undergraduate and graduate students; 17 semesters
Instrumental Analysis / General Chemistry / Physical Chemistry Lab / Analytical Chemistry Lab / Environmental Concerns and Chemical Solutions

QC Technician II, Botanical Laboratories (Ferndale, WA) 2007 – 2008
Raw material quality control, SOP development, FTIR, HPLC, TLC, titrations, small molecule physical and spectroscopic identification

EDUCATION

University of Massachusetts (Boston, MA), Ph.D. in Physical and Analytical Chemistry 2008 – 2014
Thesis: Tuning Carbon Microstructure for Advancing Electrochemical Energy Storage
Structure-function relationships of carbon / graphene materials; surface chemistry; Li-ion battery and hybrid capacitor; solid electrolyte interface (SEI layer); catalytic surface passivation

Western Washington University (Bellingham, WA), B.S. in Chemistry 2002 – 2007
Thesis: Regio-specific Implications of Benzyl-halide Nitration

SELECTED PUBLICATIONS AND PRESENTATIONS

Torok, B. Dransfield, T., Qu D., **Collins J**, Gourdin G. Green Chemistry: An Inclusive Approach—*Elsevier Publishing*. Publishing ASAP

Gourdin G, **Collins J**, Zheng D, Qu Deyang. Reaction Series for the Soluble Products Produced During SEI Layer Formation on the Carbonaceous Anode of a Li-ion Supercapacitor—*Journal of Physical Chemistry C*. In Review

Collins J, Gourdin G, Foster M, Qu D. Enhanced Li-ion pore access and stable SEI formation through oxidation and fluorosurfactant passivation of amorphous carbon electrodes. In progress

Collins J, Kipreos M, Brady R, Zheng D, Qu D, Foster M. Mechanism of surface functional group formation on onion-type carbons. In progress

Collins J, Gourdin G, Foster M, Qu D. Carbon surface functionalities and SEI formation during Li-intercalation – Review, *Carbon* 92 (2015) 193-244

Collins J, Zheng D, Ngo T, Qu D, Foster M. Partial graphitization of activated carbon by surface acidification, *Carbon* 79 (2014) 500-517

Gourdin G, **Collins J,** Zheng D, Foster M, Qu D. Spectroscopic compositional analysis of electrolyte during initial SEI layer formation, *Journal of Physical Chemistry C* (2014) 118 (31), 17383-17394

Collins J, Ngo T, Qu D, Foster M. Spectroscopic investigations of sequential nitric acid treatments on granulated activated carbon: Effects of surface oxygen groups on π density, *Carbon* 57 (2013) 174 –183

Collins J, Gourdin G, Foster M, Qu D. Capacity Folding in Double Layer Electrodes for Application in Hybrid Li-ion Battery-type Supercapacitors. *Materials Research Society*, Oral Presentation (2013 Winter)

Collins J, Gourdin G, Qu D, Foster M. Structural and Electrochemical Impacts of Oxygen Doped and Surfactant Coated Activated Carbon Electrodes in Li-ion Batteries. *American Physical Society*, Oral Presentation (2013 Spring)

Gourdin G, **Collins J**, Smith P, Jiang T, Tran T, Qu D. Spectroscopic Study of SEI Layer Formation on Negative Electrode for Lithium-ion Capacitor. *Electrochemical Society*, Oral Presentation (2012 Spring)

Collins J, Ngo T, Qu D, Foster M. Enhanced Surfactant Adsorption on Activated Carbon through Manipulation of Surface Oxygen Groups. *American Physical Society*, Oral Presentation (2012 Spring)

TECHNICAL SKILLS

Solid State Li-ion Thin-Layer Deposition: RF-Magnetron Sputtering, Metal Evaporation, Battery-on-Chip integration
Liquid State Li-ion Battery Fabrication: Carbon substrate slurry formulation, Half cells (coin cells), Full Cells (Teflon cells), SEI layer analysis (voltage dependent)
Electrochemical Characterization: Electrochemical impedance spectroscopy (EIS), Electrochemical battery tester (Arbin), Rotating Disk Electrode, Autolab/Solartron/PAR Galvanostat/Potentiostat, Cyclic voltammetry, Corrosion Analysis (paint cells)
Spectroscopy: Diffuse reflectance infrared spectroscopy (DRIFTS), Attenuated total reflection infrared spectroscopy (ATR – FTIR), Raman spectroscopy and Raman confocal microscopy, Powder X-ray diffraction (XRD), X-ray photoelectron spectroscopy (XPS), UV-Vis, Fluorometry, ICP-OES
Microscopy: Scanning electron microscopy (SEM), Energy dispersive X-ray spectroscopy (EDS), Atomic force microscopy (AFM), Transmission electron microscopy (TEM)
Software: Autolab, NOVA, ZPlot / ZView, Omnic, OPUS, Origin, SolidWorks, MS Office, CorrWare, ZPlot/ZView, CHI1660A, Labview, MatLab, VersaStudio, VersaStudio
Other: Porosimetry (BET and DFT methods), Optical profilometry, Auto-titration, Sheet Resistance