Improving electrochemical energy storage device performance

Matthew Charlton, MS&E Ph.D candidate, advised by Prof. Stevenson

Battery and SC Principles

**Battery = Redox between electrodes**

**EDLC = Charge separation at interface**

**Pseudocapacitor = Redox at interface**

**Supercapacitor Applications**

- Battery or Fuel Cell hybrids
- Load leveling in Power Systems
- Automotive Applications
- Uninterruptible Power Sources
- Solar supercapacitors
- Wind power


Addition of M-Ox coatings onto carbon powders

Goal: Effectively combine mesoporous carbon used in EDLC’s with thin redox active metal oxide coatings via ALD in order to increase the overall material capacitance with the addition of pseudocapacitive character


Mesoporous means large electrode-electrolyte interface
Education - 2nd year Ph.D in MS&E

- B.S. in MS&E from Lehigh University in 2008
- Advised by Prof. Stevenson, Clean Energy Materials Thrust
- Member of the Doctoral Portfolio Program in Nanoscience and Nanotechnology
- Classes include Electrochemistry, Electrochemical Energy Materials, Energy Technology and Policy

- GEC Energy Seminar Series Director
- ExploreUT on campus
- Nanodays at the Austin Children's Museum
- Smart.Clean.Energy Short Course