

Advanced Materials for Energy Storage Laboratory

Location

ESC 130

Management

Prof. Linda Nazar (Lead Scientist), Dr. Guerman Popov (Research Associate)

Users

Our equipment is suited for the needs of the Nazar group and is extensively used by its members. Applications from other university research groups and external companies to use the equipment are invited.

Research

- Design of nanomaterials for energy storage, conversion and delivery applications
- Materials solid state chemistry and nanotechnology
- Li-ion and lithium batteries; fuel cells; supercapacitors; hydrogen storage materials
- Fundamental solid state chemistry and structure-property relationships
- Mesoporous and nanoporous materials

Equipment

- Bruker D8 Advance powder X-ray diffractometer
- An array of furnaces allowing heat treatment of samples at temperatures up to 1600°C
- Anton-Paar Synthos 3000 microwave synthesis system
- Fritsch high-energy ball mill system
- 4 glove boxes
- Differential electrochemical mass spectrometry system
- Quantachrome Autosorb surface area and pore size analyzer
- TA Instruments SDT Q600 simultaneous TGA/DSC thermogravimetric analyzer
- Bruker TENSOR 37 FT-IR spectrometer
- Arbin BT2000 battery testing system
- BioLogic VMP3 Potentiostat/Galvanostat/Electrochemical Impedance Spectroscopy
- Rotating disk electrode system

Supporting Partners

Natural Sciences and Engineering Research Council (NSERC), Canada

Canadian Foundation for Innovation (CFI), Canada

Private companies

Access Rights

Access is normally limited to members of the group. Interested parties are invited to contact Dr. Guerman Popov (gpopov@uwaterloo.ca, x32441). User fees for the instruments vary.

Introduction

Nazar lab's research focus encompasses complex material synthesis, physical/structural characterization, electrochemical testing and electrode design for various energy storage devices that can store and deliver energy at a high rate. The focus is on energy storage materials for rechargeable batteries. New-generation electrode materials could enable their implementation in plug-in hybrid electric vehicles. They are also absolutely vital as reservoirs (i.e., load-levellers) for intermittent energy sources such as solar and wind power. Although lithium-ion batteries are the state-of-the-art rechargeable power source which has achieved outstanding technological success for portable electronics, if such large-scale systems are to be realized then fundamental innovation in materials is essential. Promising new directions particularly lie in nanomaterials. They offer the possibility of moving into the realm of high-capacity systems that operate on the basis of intimate contact of the redox active components.