

**Department of Biomedical, Chemical, and Environmental Engineering**  
**COLLEGE OF Engineering and Applied Science**

**SUMMER RESEARCH OPPORTUNITIES**  
**FOR UNDERGRADUATE WOMEN**

**APPLICATION DEADLINE: March 1, 2014**

*The Department of Biomedical, Chemical, and Environmental Engineering (BCEE) is pleased to offer the following research project for the summer of 2014. Interested students are urged to contact the faculty member(s) directing the project that most interests them. By contacting the faculty member, you can discover more about the project, learn what your responsibilities will be and, if possible, develop a timetable for the twelve-week research period.*

**PROJECT TITLE: Synthesis of Novel Porous Nanocrystal-Ionic Polymer Composite Membranes for Electrical Storage Batteries**

**Professor: Junhang Dong**  
**Department of Biomedical, Chemical, and Environmental Engineering**  
**694 Rhodes Hall**  
**Cincinnati, OH 45221-0012**  
**Tel: (513) 556-3992**  
**Fax: (513) 556-3474**  
**Email: [Junhang.dong@uc.edu](mailto:Junhang.dong@uc.edu)**

**Project Description**

This summer research project is part of our ongoing research program sponsored by the NSF (grants CBET-1263860 and CBET-0854203). The overall goal of the NSF research program is to develop the next generation of inorganic-based ion-exchange membranes (IEMs) that will lead to the establishment of new redox flow batteries (RFBs). The inorganic-based RFBs will have higher energy efficiency and unprecedented temperature-resistance suitable for large scale electrical energy storage in renewable (e.g., solar and wind) power systems. Our research addresses the fundamental issues that are critical to the successful development of such new IEMs, including (1) design, synthesis, and characterization of the IEM materials, and (2) IEM performance test in RFB and understanding of molecular/ionic transport mechanisms.

*The main objective* of this summer undergraduate research project is to synthesize thin films of a new type of microporous nanocrystal-ionic polymer composite membrane with a unique layered-structure and demonstrate its functionality and advantages in an actual flow battery set. The student working on this summer project will collaborate closely with a number of highly experienced senior Ph.D. students in our laboratory. The undergrad participant will learn and contribute specifically to the material synthesis, characterization and battery performance test.

In the past, we had a very successful WISE-REWU trainee, Ms. Annessa Burnatt (a freshman of Chemistry Dept., UC), who made significant contributions to our research and coauthored an excellent journal publication and conference presentations. [Ref: H. Jiang, R. Yang, X. Tang, [A. Burnett](#), X. Lan, H. Xiao, J. Dong, *Sensors & Actuators B-Chem.* 177 (2013) 205-212]

We hope to have more WISE-REWU student joining us this summer.