Jacob Brutman
Department of Chemistry
Kolthoff 686
(612) 626-9979
brutm003@umn.edu

Advisor: Marc Hillmyer

Research Interests: Development and improvement of healing cross-linked materials from renewable resources.

Sustainable Vitrimers from Biosourced Lactones

Crosslinked polymers with controllable healing characteristics have received significant attention over the last decade. However, there is still much to be developed with these materials in the sustainability arena. Herein, we studied the healing capabilities of crosslinked bioderived poly(lactones) through Lewis acid catalyzed transesterification reactions. Materials that use isodesmic reactions (e.g., transesterification) for healing are termed vitrimers and have been reported using a diverse range of chemistries. Our initial studies focused on the healing properties of amorphous star-shaped poly((±)-lactide) crosslinked with methylenediphenyl diisocyanate in the presence of stannous(II) octoate. These materials exhibited remarkably fast stress relaxation rates when compared with previously reported polyester-based vitrimers, and exhibited similar stress relaxation rates at temperatures 140 °C lower. Furthermore, the materials were able to recover their original tensile strengths post-healing by heating the system at 140 °C for only 30 min. These results will be described in this presentation, as well as our ongoing research efforts on utilizing renewable cross-linkers, a variety of Lewis acid catalysts, and other amorphous polyesters derived from substituted lactones.

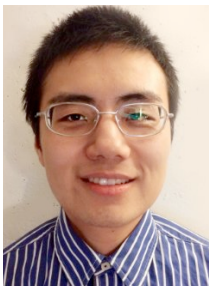
Personal Statement

I graduated from the University of Vermont in the spring of 2012 with a B.S. degree in chemistry. In the summer of 2011, I came to Minnesota through the NSF/Lando-REU program and performed research with Prof. Marc A. Hillmyer. Having enjoyed my time here, I chose to come back and start my graduate career in the Fall of 2012, under the continued advisement of Prof. Marc Hillmyer.

Selected Publications / Presentations

1. Brutman, J. P. (speaker); Delgado, P. A.; Hillmyer, M. A., Sustainable Vitrimers from Biosourced Lactones. Oral presentation at the American Physical Society March Meeting, San Antonio, TX, March 2-6, 2015.
2. Brutman, J. P.; Delgado, P. A.; Hillmyer, M. A., Polylactide Vitrimers. *ACS Macro Lett.* **2014,** *3*, 607-610.

SUYUE CHEN
Department of Chemistry, University of Minnesota
362 Kolthoff Hall
chen3094@umn.edu



Research Interests

- Metal nanostructure synthesis
- Nanomaterial characterization
- Nanomaterial based electronic device fabrication
- Crystal growth

Motivation for iPrime presentation and poster

Silver nanostructures have been the focus of intense research in the last few decades for their potential use in electrodes, surface enhanced Raman spectroscopy (SERS), antimicrobial materials, etc. Our eventual goal is to obtain silver nanowires (Ag NWs) with high purity and aspect ratio for their best performance in transparent conductive films (TCFs). Polyol synthesis is an effective method to make various silver nanostructures including Ag NWs. It is hypothesized that the size, morphology, crystal structure, and phase composition of silver seeds lay heavy influences on the final product in a polyol synthesis. However, the understanding and control over silver seeds are hindered by the fast growth of these seeds in most polyol systems using elevated temperature. In this study, we proposed a mild polyol synthesis using room temperature under UV irradiation. Such reaction produced silver nanoparticles (Ag NPs) without subsequent growth, allowing a better investigation on such particles that can serve as seeds for further reaction.

Selected Presentations and Publications

1. **Chen, Suyue**; Carey, Jesse; Whitcomb, David R.; etc.; Mild Polyol Synthesis of Silver Nanoparticles; in preparation
2. Cai, Jinguang; **Chen, Suyue**; Ji, Mei; et al.; Organic additive-free synthesis of mesocrystalline hematite nanoplates via two-dimensional oriented attachment; *Crystengcomm*, 2014, *16(8)*, 1553-1559
3. Cai, Jinguang; **Chen, Suyue**; Hu, Jun; et al.; Top-down fabrication of hematite mesocrystals with tunable morphologies; *Crystengcomm*, 2013, *32*, 6284-6288
4. Cai, Jinguang; Ye, Jianfeng; **Chen, Suyue**; et al.; Self-cleaning, broadband and quasi-omnidirectional antireflective structures based on mesocrystalline rutile TiO2 nanorod arrays; *Energy & Environmental Science*, 2012, *5(6)*, 7575-7581

Education

PhD Candidate, Department of Chemistry, University of Minnesota

Expected Graduation Date: 2017 (GPA: 4.00/4.00)

Advisor: Professor R. Lee Penn

B.S. Chemistry, Peking University, 2012

Undergraduate Thesis: Study of solvent thermal synthesized hematite mesocrystal nanoparticles and their acid etching.