



# AMERICAN CHEMICAL SOCIETY KENTUCKY LAKE SECTION

## January 2018 Kentucky Lake Section Meeting

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### Murray State University

1213 Jesse D Jones Hall

Murray KY 42071

**Tuesday, January 23<sup>rd</sup>, 2018**

**Dinner @ 6:00 pm, Presentation @ 7:00 pm**

Dinner: Catered by Willow Bistro: Massaman Curry with Chicken,  
Vegetable Fried Rice, Fruit, Tzatziki with chips, Dessert  
*The price is \$10 (Students \$5)*

**Program: Dynamic bonds in polymers:  
photolithographic and self-healing applications**

Dr. Kevin Miller, Associate Professor at Murray State University

### Comments from the Chair

Greetings KLS Members! With the turning of the calendar from 2017 to 2018, we once again find ourselves in a new year of KLS programming and leadership. Please join me in welcoming Kevin Revell as our new chair-elect. Kevin is already hard at work planning the spring program—stay tuned for more details!

This month's speaker—Dr. Kevin Miller—is one of our own and I know that you won't want to miss the opportunity to come hear why he was selected for the 2017 KLS Outstanding Professional Member Award. Dr. Miller specializes in organic and polymer chemistry at Murray State University and will be talking about applications of dynamic bonds in polymers.

As we enter the new year, I'd especially like to encourage you to be proactive in your KLS involvement. Whether that looks like attending monthly meetings, participating in committee work, helping with the kids' science centers, fostering interest in National Chemistry Week, or designing a completely new KLS activity—opportunities abound! If you are particularly ambitious, you can spearhead an application for up to \$3,500 in ACS funding through the Innovative Project Grant program. Application deadlines occur twice yearly: January 18<sup>th</sup> and June 30<sup>th</sup>.

Best wishes for a wonderful start to 2018. ~Genessa, KLS Chair

### KLS-ACS 2018 Officers

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#### KLS-ACS Web Page

<http://kentuckylake.sites.acs.org/>

## Abstract

Two short research stories will be given concerning the application of dynamic bonds in polymeric materials. In the first story, the dynamic nature of the *cis-trans* azobenzene photoisomerization will be discussed as it pertains to making photolithographic patterns based upon differences in surface tension (referred to as the Marangoni or “tears of wine” effect). An amorphous azobenzene-containing polymer was prepared and photopatterning was generated by exposing part of the film to UV light (365 or 450 nm). Differences in surface tension between the *cis*-rich and *trans*-rich portions of the polymer (surface relief grating) allowed for different topologies to be generated and could be advantageous for future photolithographic applications. In the second story, polymers containing dynamic, thermoreversible thiol-Michael bonds will be discussed in terms of their ability to exhibit self-healing properties in films. Polyester networks with varying degrees of crosslink density and dynamic bond concentration were prepared and rectangular strips were cut, reattached by hand and cured in a convection oven at 100 or 120 °C. Samples were removed after various time intervals and tensile testing was conducted to determine the extent to which the re-attached materials recovered their original mechanical properties. The dynamic nature of the thiol-Michael bond allowed for all of the materials, regardless of composition, to exhibit re-healing within 48 hours.

## Speaker Bio



Dr. Miller is a native of Indianapolis, Indiana, and attended the University of Dayton as an undergraduate, where he earned his B.S. in Chemistry. He then attended the University of Notre Dame where he earned his Ph.D. in Organic Chemistry under the advisorship of Dr. Xavier Creary. Dr. Miller then spent seven years in industry with Rohm and Haas and Dow Chemical (2003-2010), working in the areas of PVC stabilizers, solvent and emulsion-based polymers and alternative cure technologies for the packaging adhesives industry. Dr.

Miller then transitioned to academia at Murray State University and is currently an Associate Professor of Chemistry. To date, Dr. Miller has mentored over 20 undergraduate research students majoring in chemistry or biology and four Masters-degree students, resulting in 15 peer-reviewed publications and numerous presentations and local, regional and national scientific meetings. His group's research has been supported by the National Science Foundation, the American Chemical Society, the Research Corporation for Science Advancement, the Kentucky Science and Engineering Foundation and Kentucky NSF EPSCoR.