MSE 520: SEMINAR SERIES

MATERIALS SCIENCE & ENGINEERING | WINTER 2017

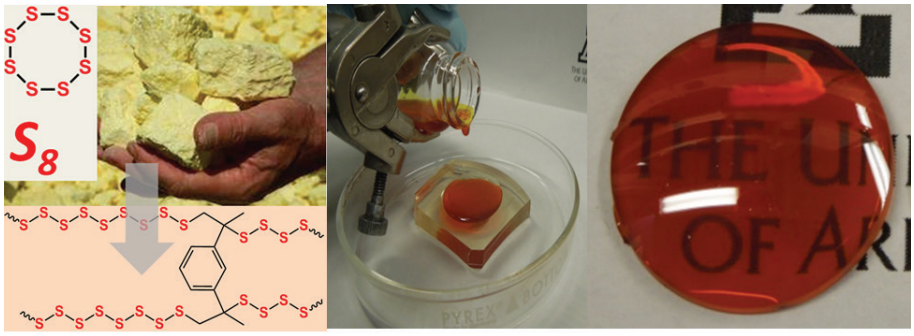
JANUARY 23, 2017 | MUELLER 153 | RECEPTION: 3:30 PM LECTURE 4:00 PM

From Garbage to Plastics and Beyond: Polymerizations with Elemental Sulfur

An incredible surfeit of elemental sulfur (nearly 7 million tons annually) is generated via refining of fossil fuels to remove hazardous emission from gasoline. Furthermore, there remain very limited uses for this waste sulfur in the chemical industry for various chemical, or material applications (the exception being sulfuric acid production). Hence, to address this important environmental and chemical challenge, we have developed new chemical synthetic and processing methods for the utilization of elemental sulfur to form polymeric materials. We recently demonstrated the use of liquid sulfur as the reaction medium for the synthesis of chemically stable and processable copolymer materials using a methodology, termed, inverse vulcanization (Fig. 1). 3,4,5 We discuss the significance of the "excess sulfur problem" along with useful properties and application of sulfur based plastics.

Recent Review Papers on this work

1. "Recent Synthetic and Processing Approaches for the Direct Use of Elemental Sulfur for Advanced Materials," Lee, J.; Pyun, J.; Char, K. Angew. Chem. Int. Ed. 2015, 54, 3249-3258.
2. "Polymerizations with Elemental Sulfur: A Novel Route to High Sulfur Content Polymers for Sustainability, Energy and Defense," Griebel, J.J.; Glass, R.S.; Char, K.; Pyun, J. Prog. Polym. Sci. 2016, 58, 90-125.



Professor Jeffrey Pyun

Professor, Department of Chemistry & Biochemistry, University or Arizona

Professor Jeffrey Pyun obtained his BA in Chemistry at Northwestern University in 1997. As an undergraduate, he worked under Prof. Joseph Lambert and later joined the group of Prof. Krzysztof Matyjaszewski at Carnegie Mellon University for graduate studies. In 2002, he obtained his PhD in Chemistry working in the area of controlled radical polymerization applied to the synthesis of organic/inorganic hybrid materials. He then moved on to postdoctoral research in a joint position with Prof. Jean M.J. Fréchet and Prof. Craig J. Hawker at the IBM Almaden Research Center from 2002-2004 focusing on the synthesis of complex macromolecular architectures for catalysis. In Fall 2004, he joined the faculty in Chemistry at the University of Arizona as an Assistant Professor, was promoted to Associate Professor in 2010 has been a Full Professor since 2015. Since 2009, he has also served as a World Class University Professor, in the School of Chemical & Biological Engineering at Seoul National University. Prof. Pyun's research interests focus on the synthesis, self-assembly, characterization and device evaluation of novel polymers, nanoparticles, nanocomposites and thin films. He is currently working on materials are anticipated to broadly impact the areas of information storage, optical materials, sulfur utilization, photocatalysis-solar fuels and energy storage technologies. Prof. Pyun's research contributions have been recognized by a number of prestigious awards for young investigators, namely, the National Science Foundation CAREER Award (2006), the Office of Naval Research Young Investigator Award (2007), the IBM Faculty Award (2007), the Alfred P. Sloan Foundation Research Fellowship (2009) and the important contributions to the magnetic tape industry thru the Information Storage Industry Consortium (INSIC) Technical Achievement Award (2009). He was also appointed a Kavli Fellow in 2015. He has also been recognized by the University of Arizona with the Innovation and Impact Award from Tech Launch Arizona, along with the Catalyst award from the Department of Chemistry & Biochemistry in 2016.

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