

# Spring 2022 Joint Colloquium

## Materials Department & Materials Research Laboratory

Dr. Yoan Simon

School of Polymer Science and Engineering

University of Southern Mississippi

Friday, April 22, 2022

11:00 am

ESB 1001



### **Networks: Taking care of connections and their environment.**

The past decade has seen a regain of interest for polymeric networks on account of their unique properties (e.g. resistance to solvents, durability) which makes them suitable for a variety of applications ranging from coatings to insulating foams to structural materials in transport applications. Fueled by concerns of sustainability, covalent adaptable networks, whereby reversible covalent bonds, aka dynamic covalent chemistry, enable the rearrangement of bonds and ultimately reprocessability of the materials have blossomed. Motivated by these attributes, we set out on a journey to unravel the governing principles of associative dynamic exchanges by modulating the chemistry of uncatalyzed exchanges in diketoenamines and diketoxime structures by utilizing orthogonal thiol-ene photopolymerization. Specifically, we will broach the topics of chemical exchange and chain dynamics and their overall impact on the rheological properties of the materials. We will also discuss counterintuitive behavior that we discovered in the photopolymerization of thiol-ene networks in the presence and absence of solvent, wherein solvent-cured systems repeatedly exhibited both a higher glass transition temperature ( $T_g$ ) and a lower elastic modulus above said  $T_g$ . This unexpected behavior appeared to be amplified for higher-functionality and more rigid monomers and drastically impacted the thermal expansion of the materials, suggesting a complete different topological connectivity of the networks despite apparent full monomer conversion. We believe that these findings can have huge impacts on the transport properties, the reprocessability and the performance of such systems and could be used as an additional handle to tune materials properties.

### **Bio**

Yoan holds a Bachelor's and Master's degree from the Ecole Nationale Supérieure de Chimie de Montpellier. His first contact with research was in the labs of Prof. Bernard Boutevin where he worked on controlled radical polymerization. He started a Ph.D. in Polymer Science and Engineering from the University of Massachusetts, Amherst under the guidance of Prof. E. Bryan Coughlin working on hybrid organic/inorganic materials. In 2008, Yoan got an ETH Fellowship to work on two-dimensional polymers under the supervision of Prof. A. Dieter Schlüter at the Swiss Polytechnic Institute of Technology in Zürich. After a year, he took on a position as junior Faculty (maître-assistant) at the Adolphe Merkle Institute in Fribourg, Switzerland where he stayed for six years developing new research avenues in the field of optically and mechanically active polymeric materials in the Polymer Chemistry and Materials group led by Prof. Christoph Weder. In January 2016, Yoan has joined the School of Polymer Science and Engineering at the University of Southern Mississippi as an Assistant Professor and was promoted to Associate Professor in August 2021.

Yoan's research was recognized at several stages in his career being the recipient of a Leonardo Da Vinci Fellowship, two Massachusetts Space Grant Consortium Grant, an ETH Fellowship. In 2015, Yoan was the Hans and Marlies Zimmer International Scholar at the University of Cincinnati and now holds the Southern Society for Coatings Technology Professorship in Polymer Science at Southern Miss and received an NSF CAREER award in 2020.

<https://www.simonresearchgroup.org>

Hosted by Chris Bates.