MSE SEMINAR

September 8, 2017
113 McBryde Hall
3:30 – 4:30 PM
Refreshments at 3:00 PM

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"Synthesis and Evaluation of High Temperature Phthalonitrile Polymers"

Abstract

Novel polymer encapsulation materials are required to enable high-temperature, wide-band gap power electronic technology. Phthalonitrile based materials are a promising candidate for this application due to their high temperature stability, good dielectric properties, and ease of processing compared with other high-temperature materials. These materials show high glass transitions that do not limit the use temperature. Instead use temperature is limited by thermo-oxidative degradation. To investigate the effect of the addition of silicon on the processing and thermo-oxidative stability of phthalonitriles, three novel silicon containing monomers were synthesized, incorporating carboxysilane, carbosilane, and carbosiloxane linkages. The thermal and thermo-oxidative properties of synthesized materials were compared with and commercial phthalonitriles. All materials considered show very stability in TGA and show little degradation during extended aging at 250°C. A test plan for characterizing the dielectric properties of the synthesized polymers will also be presented.

Biosketch

Jacob Monzel graduated with a Bachelor's degree in Materials Science and Engineering from Virginia Tech in 2011. He interned for Corning Inc. Metallurgy division during the summers of 2011 and 2012. Mr. Monzel continued his education at Virginia Tech, completing his Master's degree in 2014. During this timeframe, he also worked part time as a materials engineer for Theta Tech Solutions LLC, where he supported aerospace design efforts. During the summer of 2014 he interned with the Air Force Research Laboratory at Kirtland Air Force Base, New Mexico. There he conducted research on additive materials for high power microwave systems and received the AFRL Outstanding Scholar Award. Also in 2014, he received a SMART Fellowship with the Air Force Research Laboratory at Wright Patterson Air Force Base, Ohio, which currently supports his PhD research.