

IOWA STATE UNIVERSITY

Materials Science & Engineering Department

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Final Oral Examination
PhD Student with Michael Kessler

Tuesday, April 15 · 11:00 AM · 0312 Gilman Hall

“Synthesis and characterization of liquid crystalline epoxy resins”

Carbon fiber reinforced polymer composites (CFRPs) plays an important role in facilitating the development of energy efficient systems. However, there are still several critical issues limiting the use of CFRPs in high performance applications, including the relatively poor matrix properties and the residual stresses induced dimensional instability. A potential strategy to solve the problems mentioned above involves the development of novel polymer matrices with improved thermal and mechanical properties and low coefficient of thermal expansion (CTE) to ensure minimal mismatch in CTE between polymer matrices and fiber reinforcements.

The objective of this work is to investigate a unique class of thermosetting materials known as liquid crystalline epoxy resins (LCERs) and evaluate the potential use of LCERs as polymer matrices in CFRPs. LCERs exhibit a polydomain structure with individual liquid crystalline (LC) domains distributed in the crosslinking networks, thereby combining the outstanding properties of liquid crystals and thermosets. The presence of the rigid LC domains is expected to improve thermal and mechanical properties of the resins. In addition, liquid crystals possess properties that can be controlled by external fields, greatly improving the design flexibility. These attractive features make LCERs good candidates for polymer matrices in high performance composites.