Project Title: Manufacturing Self-Healing and Self-Reporting Fiber-Reinforced Composites

Advisors: Kelly Chang (3rd year PhD Student, MatSE), Prof. Nancy Sottos

Project Description:

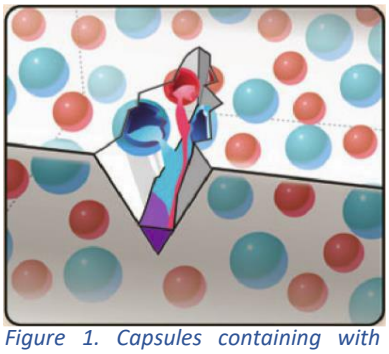

Figure 1. Capsules containing with healing agent fill the damaged volume (White et al., 2011).

Biologically inspired self-healing and self-reporting polymers have exhibited the ability to autonomously indicate and repair damage. In capsule-based healing systems, an autonomous healing reaction is triggered by rupturing an embedded microencapsulated healing agent, which reacts with the polymeric matrix (e.g. epoxy or thermoplastic) to heal the damaged volume. Similarly, self-reporting has been achieved by embedding microcapsules (sub-10 μm diameter) containing photoluminescent molecules, which fluoresce or change color upon rupture to indicate the damaged region. This project aims to explore the impact these capsules can have on the mechanical performance of fiber-reinforced composite materials. As an undergraduate researcher, you will synthesize, process, and characterize these microcapsules and help with the composite manufacturing process. You will learn to use numerous analytical (e.g. TGA, MS, image analysis, etc.), microscopy (e.g. optical, SEM, and confocal), and composite manufacturing techniques to complete these tasks.

Student Background and Expected Research Activities:

We are looking for a driven and detail-oriented undergraduate student who is interested in learning composite manufacturing, numerous characterization techniques, and the highly delicate process of capsule synthesis. Wet lab experience and a background in polymer science and/or composites is preferable, but not required. The student will be expected to follow all safety guidelines and proper procedures by their mentor and lab management.

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