**Chitosan-Based Shrinking Fibers for Post-Cure Stressing to Increase Durability of Concrete**

Diarmuid Gregory1, Robert Worley II2, Joshua Allen1, Mathew Kaplita2, Dryver Huston1

1Mechanical Engineering, 2Civil and Environmental Engineering, University of Vermont, Burlington, VT 05405, USA

**Abstract**

Concrete is a ubiquitous building material with an extensive history, yet it has a fair number of imperfections. Its sizeable environmental impact, low tensile to compressive strength ratio, and lack of durability leave room for innovation. Concrete durability frames the motivation for this research.

This poster presents the motivation, methods, and findings of tests performed to quantify the durability of concrete reinforced with automatically shrinking chitosan-based fibers. Two different types of durability tests were carried out: rapid freezing and thawing and chloride penetration. Freeze-thaw damage is a recurrent form of weathering and a significant cause of concrete damage. Chloride ions from salt can penetrate concrete and corrode rebar, subsequently deteriorating the concrete.

From the freeze-thaw test, shrinking (active) fiber reinforced concrete had up to a 219% increase in durability factor over non-shrinking (passive) fiber reinforced concrete and a 540.5% increase over non-reinforced concrete. Results from a chloride penetration test utilizing Wenner probe electrical resistance measurements suggested that active fiber reinforced concrete had lower rates of chloride ion penetration than passive fiber concrete. Following the second partial immersion in saltwater, active fiber prisms had up to a 157.5% greater resistance than passive ones.

**Acknowledgements:** This project was financially sponsored by USDOT through TIDC, Project 2.7 with Jim Wild of VTrans as Technical Champion