

Synopsis:

Transparent, Impact Resistant Nanocomposites



Background

Military and commercial industries demand transparent, impact resistant polymer-matrix composites for their lightweight, visibility, and enhanced mechanical properties, not met by conventional transparent polymers. Carbon nanotubes (CNTs) have proven to be an excellent candidate for reinforcing and toughening polymer matrices by tailoring the nanostructure. However, impregnating polymers with CNTs tends to affect transparency adversely. In addition, the toughening mechanisms of CNTs in polymer matrices are not well understood, thus rendering consistent nanotailoring difficult.

Goals

- Develop CNT-reinforced polymer composites with see-through-grade transparency and enhanced toughness
- Develop effective and scalable methods to disperse CNTs in transparent polymers
- Develop methodologies for composite architecture design for maximized through-thickness properties
- Identify CNT-based toughening mechanisms that contribute to enhanced properties

Projects/Research Highlights

- Fabrication of high-clarity polymer/CNT composite films through optimized CNT dispersion
- Fabrication of mechanically enhanced, transparent polymer/CNT composite panels using novel composite structure configurations
- Comprehensive testing of processed composite panels

Benefits to Industry

- Lightweight, see-through, high impact and ballistic resistance, protective panels
- Tailored composite properties through optimized CNT dispersion and lamination techniques
- Scale-up production of mechanically enhanced composite films and panels