DREXEL UNIVERSITY
Materials Science and Engineering
College of Engineering

Synthesis and Characterization of Multifunctional Epoxy-matrix Nanocomposites with Transition Metal Carbides/Carbonitrides (MXenes)

PhD Thesis Proposal

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Location: Hill Conference Room

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Abstract: Polymers have gained much attention in recent years due to their easy processing, low specific weight, low cost, and wide use in many applications. Epoxy resins are most commonly used for manufacturing structural parts in automotive and aerospace industries as well as adhesives and coatings due to their good adhesion properties, chemical inertness, and thermal stability. However, mechanical and electrical properties can be engineered and further improved with the addition of nanomaterial fillers.

In this study, we focus on the development of new multifunctional epoxy composite materials using two-dimensional (2D) transition carbides and carbonitrides (MXenes). While it has been demonstrated that MXenes can be dispersed into various polymer systems leading to improved properties, optimization of the filler-matrix interfaces for improved stress transfer and effect of dispersion on final composite properties have not been fully addressed. No studies on mechanical and electrical properties of bulk Ti_3C_2 MXene-epoxy systems have been reported so far. Therefore, the aim of this study is to understand the effect of composite processing conditions with regards to the different types of MXene, flake size and surface modification and how it defines bulk mechanical and electrical properties.