Mechanical Properties of GNPs Toughened Flax/Epoxy Composites for Aerospace Applications

Abstract- The aerospace industry's need for lightweight and high-performance materials has prompted researchers to explore sustainable alternatives to traditional fiber composites. Flax fibers have emerged as a promising option due to their affordability, renewable nature, and eco-friendliness. However, the brittleness inherent in flax fibers currently limits their applicability in structural uses. This study focuses on enhancing the mechanical properties of flax/epoxy composites by incorporating graphene nanoplatelets (GNPs). Vacuum infusion moulding was used to create the composites, and a mix of sonication and mechanical stirring was used to evenly distribute the GNPs throughout the material. Standard American Testing Methods were used to assess the material's mechanical and physical performance. The results showed that the addition of GNPs significantly decreased the composite density. Flax/epoxy composites with an optimized graphene nanoplatelet content of 0.66% were found to be superior to all other compositions evaluated, including the pure flax/epoxy composite, which showed the best tensile, flexural, and interlaminar shear performance.

Keywords: flax/epoxy composite, nano-particle, graphene, dispersion, mechanical properties.