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Enhancement of Interface Properties of Thermoplastic Composite Materials

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Abstract : There are a limited number of global companies in the world that manufacture and commercially offer thermoplastic composite prepregs in accordance with aerospace requirements. High-performance thermoplastic materials supplied for aerospace structural applications are PEEK (polyetheretherketone), PPS (polyphenylsulfite), PEI (polyetherimide), and PEKK (polyetherketoneketone). Among these, PEEK is the raw material used in the first applications and has started to become widespread. However, the use of these thermoplastic raw materials in composite production is very difficult due to their high processing temperatures and impregnation difficulties. This study, it is aimed to develop carbon fiber-reinforced thermoplastic PEEK composites that comply with the requirements of the aviation industry that are superior mechanical properties as well as being lightweight. Therefore, it is aimed to obtain high-performance thermoplastic composite materials with improved interface properties by using the sizing method (suspension development through chemical synthesis and functionalization), to optimize the production process. The use of boron nitride nanotube as a bonding agent by modifying its surface constitutes the original aspect of the study as it has not been used in composite production with high-performance thermoplastic materials yet. For this purpose, laboratory-scale studies on the application of thermoplastic compatible sizing will be carried out in order to increase the fiber-matrix interfacial adhesion. The method respectively consists of the selection of appropriate sizing type, laboratory-scale carbon fiber (CF) / poly ether ether ketone (PEEK) polymer interface enhancement studies, manufacturing of laboratory-scale BNNT coated CF/PEEK woven prepreg composites and their tests.

Keywords : carbon fiber reinforced composite, interface enhancement, boron nitride nanotube, thermoplastic composite
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