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ENHANCING MECHANICAL PROPERTIES OF BOLTED CARBON/EPOXY NANOCOMPOSITES WITH CARBON NANOTUBE, NANOCLAY, AND HYBRID LOADING

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ABSTRACT

The effects of adding nanoclay (NC), carbon nanotube (CNT), and a hybrid of both on bending, tensile and bearing strengths of nanocomposite plates were investigated in this study. Sonication method was used to ensure dispersion of the nanoparticles in epoxy homogeneously. The nanocomposite plates were produced by a vacuum assisted resin transfer molding (VARTM) process. Mechanical properties were investigated by applying bending and tensile testing as well as tensile test with bolted joints on the nanocomposite plates. According to the bearing strength, 5.2%, 3.9%, and 0.8% improvements were obtained in NC, CNT and hybrid (NC+CNT) loaded specimens respectively while much more improvement range from 47.7% to 57.1% was obtained in tensile strength. In addition, the impact of nanoparticle loading on the porosity was determined by applying the burning test and its effect on the mechanical properties was discussed.

Keywords: A. Carbon fiber; A. Nanostructures; B. Mechanical properties; E. Joints

1. INTRODUCTION

The use of composite materials is becoming widespread increasingly and this has led to different applications of composite materials under various circumstances [1-7]. One of these different circumstances is mechanical connection of two composite materials with bolt. Moreover, nanotechnology has recently been utilized to develop mechanical and physical properties of composite materials. Loading of nanoparticles in the matrix material has become a commonly used method for this reason [8-11].

Over the past few years, remarkable research have been directed toward joints in composite materials. Mechanical joints and adhesively bonded joints are two main types of joints in composite materials. The latter is strongly affected by the environment like humidity or temperature [12]. Mechanical joints are detachable joints unlike adhesively bonded joints. Common bearing test failure modes of composite bolted joints are net-tension,

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