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Kürşat Gültekin, Salih Akpinar, Ahmet Gürses, Zafer Eroglu, Salim Cam, Hamit Akbulut, Zeki Keskin, Adnan Ozel

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The Effects of Graphene Nanostructure Reinforcement on the Adhesive Method and the Graphene Reinforcement Ratio on the Failure Load in Adhesively Bonded Joints

Kürşat Gültekin[1], Salih Akpinar[*2], Ahmet Gürses[1], Zafer Eroglu[1], Salim Cam[3], Hamit Akbulut[1], Zeki Keskin[4] and Adnan Ozel[3]

[1]*Dept. of Mechanical Eng., Ataturk University, 25240 Erzurum, TURKEY*
[2]*Dept. of Mechanical Eng., Erzurum Technical University, 25050 Erzurum, TURKEY*
[3]*Dept. of Mechanical Eng., Erzincan University, 24100 Erzincan, TURKEY*
[4]*Turkish Airlines Technic Inc., Istanbul, TURKEY*

Abstract: *This study experimentally determines the tensile failure load of the nanocomposite adhesive – obtained by adding nanostructures to the adhesive – using four different methods in single-lap joints. For the study, adhesively bonded single-lap joints were produced by using DP460 liquid structural epoxy as the adhesive, AA2024-T3 aluminum alloy as the adherend and graphene as the nanostructure. When the failure load obtained from the experiments was examined, it was seen that, while the nanostructure-reinforced methods indicated in the literature have a great effect on the failure load of the joint and the standard deviation, a new method developed in this study increased the failure load of the joint and minimized the standard deviation. These improvements increased the reliability and reproducibility of the joint.*

Keywords: A. Nano-structures/nanostructures, B. Adhesion, B. Strength, D. Mechanical testing, E. Joints /joining, E.Cure.

1. Introduction

Because of the rapid development in adhesive technology, adhesively bonded joints are increasingly being used in the automotive, aerospace, marine and medical sectors. These developments are also important to the production of a new bonding element (nano adhesive), using the advantages of carbon nanostructure-reinforced polymers in bonded joints. Although nanostructure-reinforced bonded joints provide great advantages, major difficulties are encountered in determining the mechanical features of these joints, their reliability and reproducibility [1-5].

Polymers containing internal nanostructures have focused attention on nanocomposite materials and the adaptation/implementation of this development in fiber-reinforced composites, known as general engineering composites, give productive results. In combination with the knowledge of adhesive joints reinforced with conventional additives, it is seen that the use of carbon nanostructure-reinforced polymer adhesive in bonded joints has yet to become widespread [6–10].

[*] Please address correspondence to phone :(90-532) 363 1099. E-mail: salih.akpinar@erzurum.edu.tr