



Effects of silica nanoparticles on glass and carbon fiber epoxy composites

Efectos de las nanopartículas de sílice sobre compuestos epoxi de fibra de vidrio y carbono

Thaker S. Dawood^{1,*}, Basim M. Fadhil², Dlair O. Ramadan³

¹ Department of Basic Sciences, College of Agricultural Engineering Sciences, University of Duhok, Duhok, Iraq.

² Department of Automotive Technology, Erbil Technology College, Erbil Polytechnic University, Erbil, Iraq.

³ Department of Technical Mechanical and Energy Engineering, Erbil Technical Engineering College, Erbil Polytechnic University, Erbil, Iraq.

* thaker.saleh@uod.ac

(recibido/received: 18-junio-2023; aceptado/accepted: 15-septiembre-2023)

ABSTRACT

In a variety of industries, including construction, automotive, marine, and aerospace, hybrid composite materials have great promise as engineering materials. By carefully choosing both the fibers and matrix employed, they enable designers to obtain desired qualities to a significant degree. The qualities of the material may be altered and adapted by adding various fiber types to a common resin matrix. In order to assess their potential for structural applications, the mechanical properties of a glass and carbon fiber epoxy composite reinforced with silica nanoparticles were examined and compared to those of clean epoxy. The samples were created using the vacuum bag process and heat-cured regardless of the laminated material. To guarantee accurate and trustworthy findings, mechanical characteristics including E_1 , E_2 , G_{12} , and ν_{12} were assessed using the tensile test and the relevant ASTM standards. To evaluate substantial variations in the mechanical characteristics of the glassy epoxy and carbon epoxy composites, experimental and numerical modeling will be used. The findings of this study suggest that silica nanoparticles improve the mechanical properties of composite materials. As a result, performance and strength are enhanced when using these reinforced epoxy compounds in structural applications.

Keywords: Reinforced polymer; mechanical properties; hybrid nano silica composites; glass fiber.

RESUMEN

En una variedad de industrias, incluidas la de la construcción, la automotriz, la marina y la aeroespacial, los materiales compuestos híbridos son muy prometedores como materiales de ingeniería. Al elegir cuidadosamente tanto las fibras como la matriz empleada, permiten a los diseñadores obtener las cualidades deseadas en un grado significativo. Las cualidades del material pueden alterarse y adaptarse añadiendo varios tipos de fibras a una matriz de resina común. Para evaluar su potencial para aplicaciones estructurales, se examinaron y compararon las propiedades mecánicas de un compuesto epoxi de fibra de vidrio y carbono reforzado con nanopartículas de sílice con las de un epoxi limpio. Las muestras se crearon mediante el