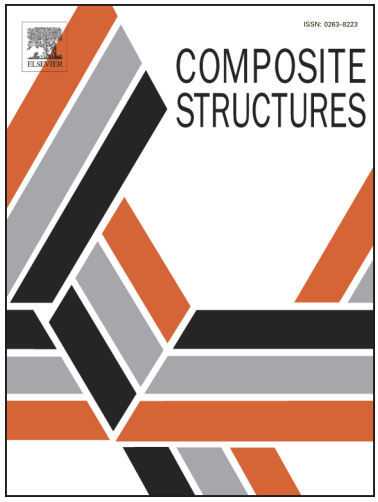

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M. Dworak, A. Rudawski, J. Markowski, S. Blazewicz

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Dynamic mechanical properties of carbon fibre-reinforced PEEK composites in simulated body-fluid

M.Dworak[1], A.Rudawski[1], J. Markowski[2], S.Blazewicz[1*]

[1] AGH- University of Science and Technology, Faculty of Materials Science and Ceramics, 30-059 Krakow, al.Mickiewicza 30, Bldg. A-3, Poland

[2] Medical University of Silesia, 40-752 Katowice, ul. Medykow 18, Bldg. C-1, Poland

*corresponding author: emails: blazew@agh.edu.pl

Abstract

The work presents the fatigue mechanical properties of a composite material made of polyetheretherketone (PEEK) polymer and carbon fibres (CF) designed for structural biomaterials. Composite samples with various types of carbon fibre reinforcements were studied. The mechanical durability of the composite samples in simulated body solution was analysed. The samples were loaded for a predetermined number of cycles for various applied-force levels, at a frequency of 50 Hz under a bending force, and at 1Hz under compression force. The mechanical changes were analysed taking into consideration the anisotropic structure of the composite samples made of fibre roving 1D, 2D tissue and carbon fibres in the form of braided fibre sleeves (MD). The ultrasonic method was applied to determine the changes in velocities measured in the composites. The average variations of mechanical stability of the composite samples kept in simulated body fluid were not significant after fatigue testing up to $1*10^6$ cycles.

Keywords: carbon fibres, fibre sleeves, PEEK matrix, mechanical properties, fatigue properties,

1. Introduction

Polyetheretherketone is one of the major engineering thermoplastic polymers used in many industrial and medical areas. This is due to its outstanding properties including chemical stability, resistance to radiation, high strength, and proven biocompatibility, which make it a candidate for polymer biomaterials.