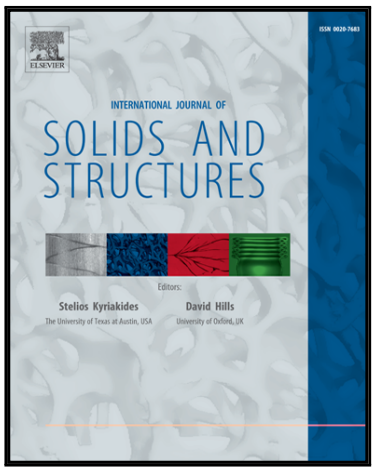

Experimental study of modulus, strength and toughness of 2D triangular lattices

Huaiyuan Gu, Martyn Pavier, Anton Shterenlikht

PII: S0020-7683(18)30261-0
DOI: 10.1016/j.ijsolstr.2018.06.028
Reference: SAS 10038

To appear in: *International Journal of Solids and Structures*

Received date: 20 September 2017
Revised date: 20 June 2018
Accepted date: 26 June 2018

Please cite this article as: Huaiyuan Gu, Martyn Pavier, Anton Shterenlikht, Experimental study of modulus, strength and toughness of 2D triangular lattices, *International Journal of Solids and Structures* (2018), doi: 10.1016/j.ijsolstr.2018.06.028

Experimental study of modulus, strength and toughness of 2D triangular lattices

Huaiyuan Gu*, Martyn Pavier, Anton Shterenlikht

Department of Mechanical Engineering, University of Bristol, Queens Building, University Walk, Bristol BS8 1TR, UK

Abstract

Prior analytical and numerical studies have shown that the triangular lattice is one of the stiffest, strongest and toughest geometries of 2D lattices. However, there has been little previously published experimental data on mechanical properties of triangular lattices. In this work the modulus, tensile strength and fracture toughness of 2D triangular lattices have been measured experimentally. The accuracy of existing prediction methods for lattice properties has been evaluated. The dependence of strength and toughness on the orientation of the lattice has also been measured. It has found that the tensile strength and fracture behaviour vary markedly with orientation, although the lattice modulus is isotropic. The measured results agree well with analytical and FE predictions.

Keywords: triangular lattices, lattice orientation, fracture toughness, tensile strength, lattice modulus, FE analysis

1. Introduction

Lattice structures are periodic cellular solids which allow reasonable material properties to be achieved with very low densities. Typical uses are in the automobile and aerospace industries, for example car head-rests and aircraft fuselages[1, 2, 3].

*Corresponding author
Email address: hg1740@bristol.ac.uk (Huaiyuan Gu)