CARBON FIBER AND PLANT FIBER COMPOSITE TECHNOLOGY DEVELOPMENT IN HIGH STRENGH PARTS

OGLEKĻA ŠĶIEDRAS UN ŠĶIEDRAUGU KOMPOZĪTMATERIĀLU TEHNOLOĢIJAS IZSTRĀDE AUGSTAS IZTURĪBAS DETAĻU IZGATAVOŠANAI

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Abstract. Natural abundance, low density, high strength per unit weight, and biodegradability of natural materials, specifically natural fibres, render them attractive for other reinforcements. In order to clarify the effect of natural fibers as reinforcments upon the tensile strength of polyacrylonitrile (PAN)-based carbon fibres, experimental as well as theoretical studies have been performed. A new material developing has been made in combining different fiber materials and testing them for strengh.

Keywords: carbon fiber, composite materials,flax.

Introduction

The Carbon fiber is widely used as structural reinforcement in composites used in applications requiring excellent mechanical properties and light weight [1–3]. The most commercially available carbon fiber currently is produced from the polyacrylonitrile (PAN) precursor using wet spinning technique. In the stabilization and carbonization processes of the precursor, several kinds of decomposition gases like HCN and H2O are released, which is totally unavoidable [3]. A number of voids were developed mainly in the external zones of the PAN-based carbon fibers, which was proved through small angle X-ray scattering studies [4–5]. Due to the different process of manufacturing, commercially available carbon fiber varies according to the precursors, strength, stiffness [6]. It was known that the tensile strength of carbon fibers. The tensile strength at gauge lengths was successfully evaluated and a tensile strength as high as was observed experimentally for commercially-available PAN-based carbon and flax fibers , showing their potential high tensile strengths. PAN-based carbon fibres are now widely used in a broad range of applications that include sporting and leisure, aerospace, industrial and, most recently, automotive [7] due to their high Young's modulus and excellent tensile strength. In order to maximise these mechanical properties, a deep understanding of the effect of the fibre structure upon its properties is necessary so that precise control of the basic fibre structure becomes possible.

Materials and methods

Composite material main structure is fibers and their characteristics has been researched and tested. Main used material was carbon fibers, flax and glass fibers which glued togethet to be holded together. Composite materials has testet for tensil strengh on Zwick/Roell Z150 machine. Data was registered on PC. Each workpiece has been made in vacuum. Vacuum depression in mould was 99.9%. A new material developing has been made in combining different fiber materials and testing them for strengh. All materials were purchased from Easy Composites Ltd., UK and used as received.

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Results

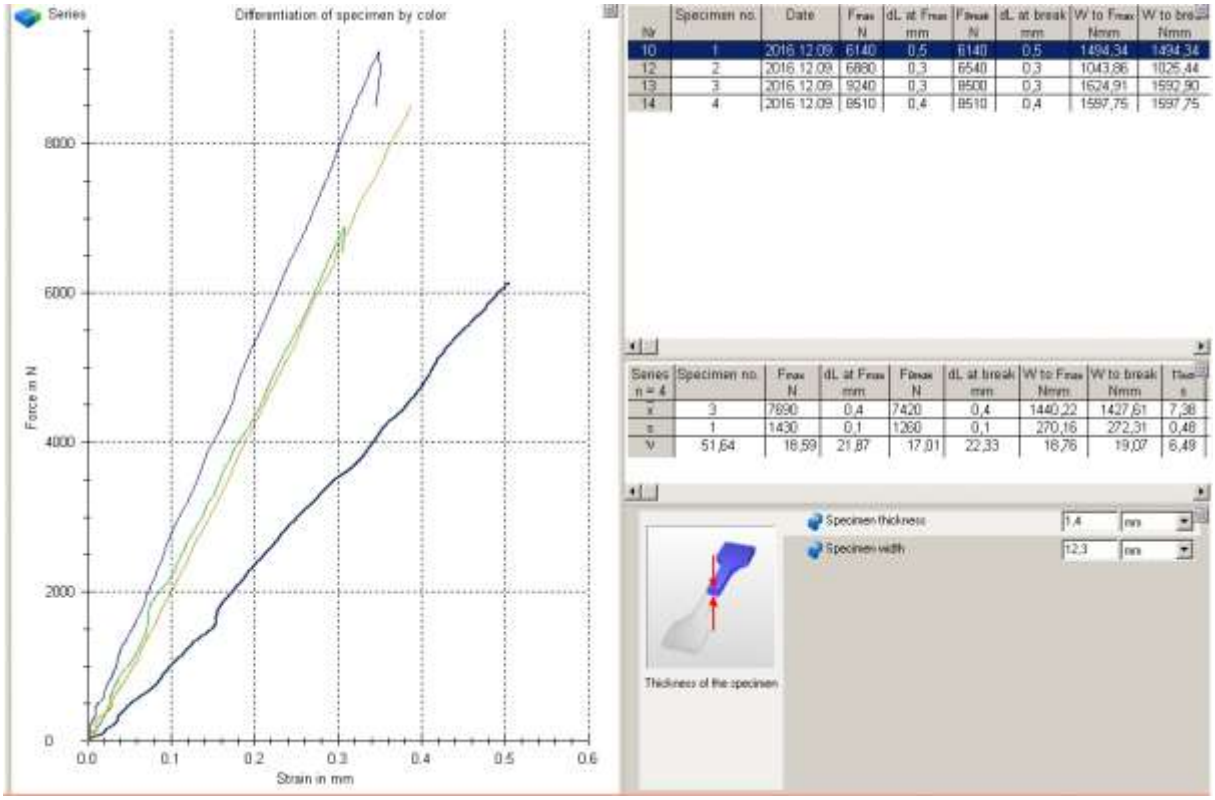

Fig.1 **Showed tensile strengh for carbon fiber with mechanical cut and laser cut**

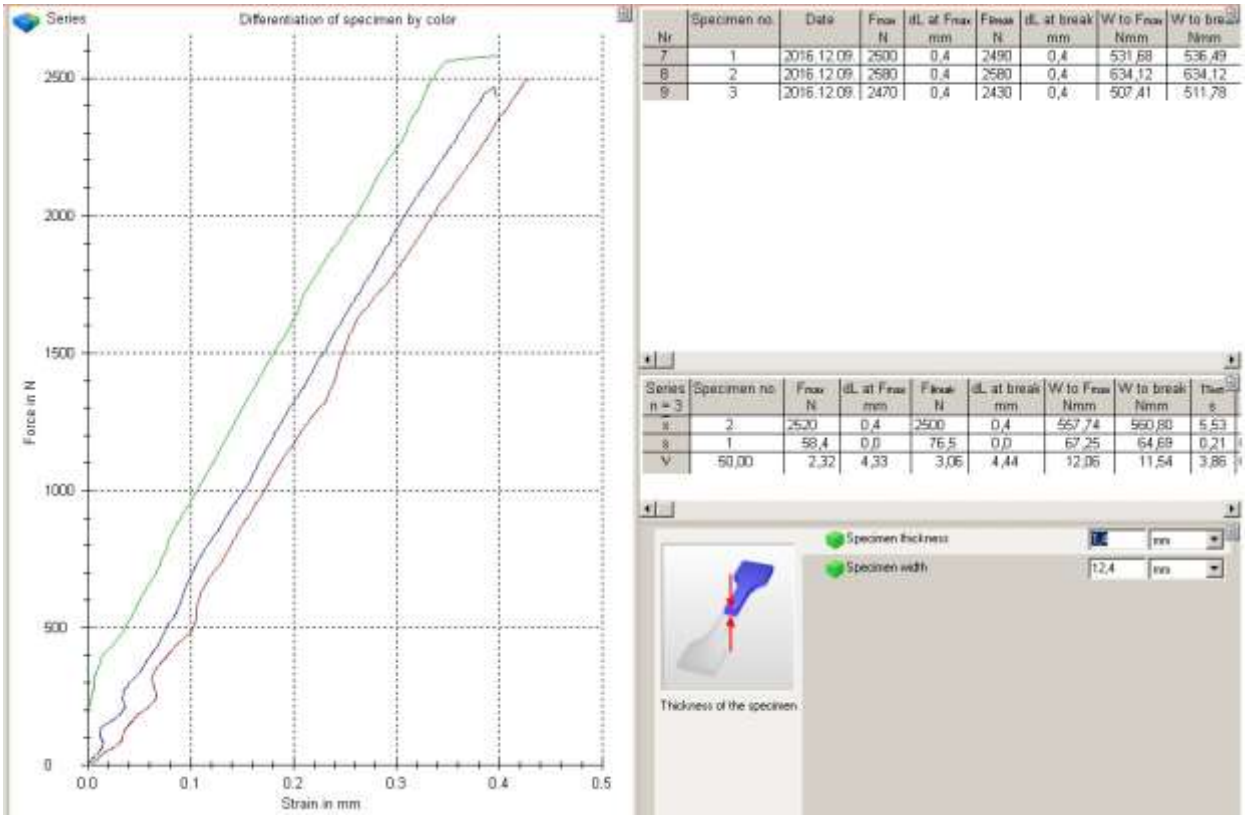

Fig.2 **Showed tensile strengh for carbon and flax fiber**

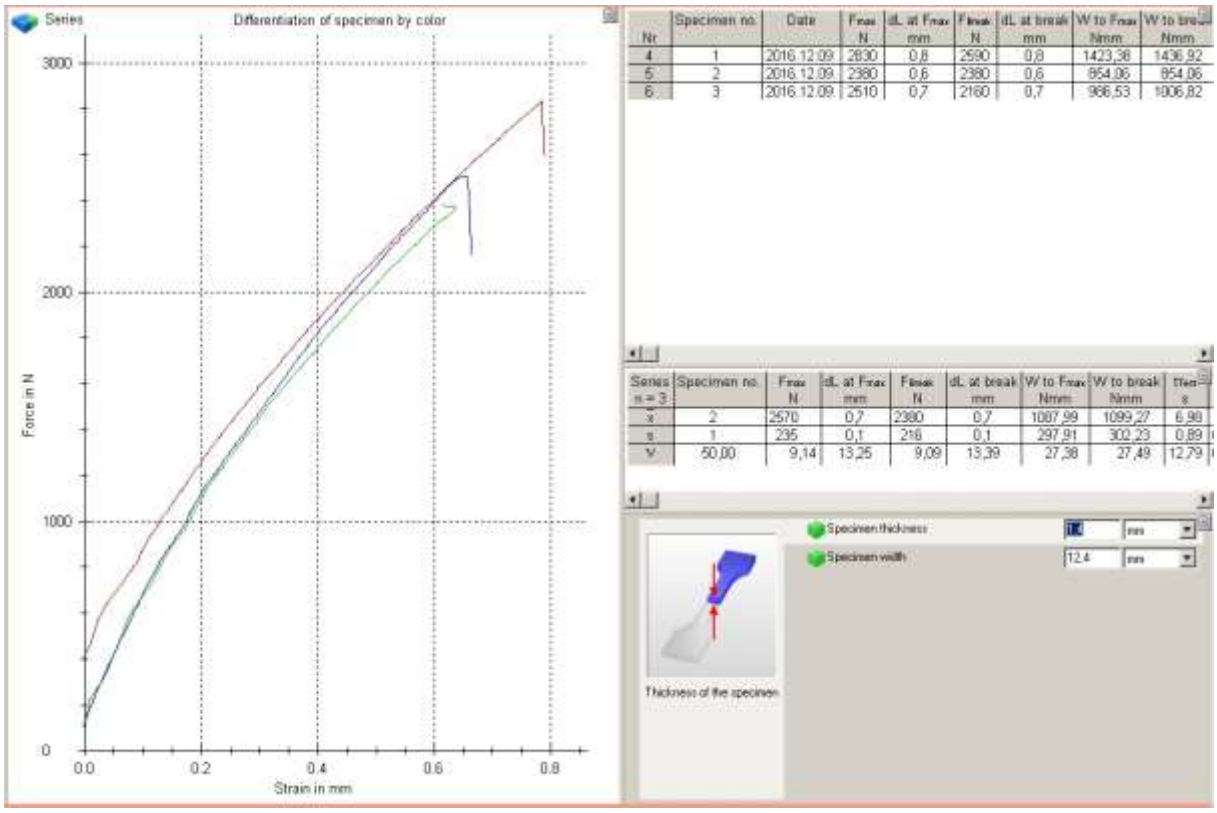

Fig.3 **Showed tensile strengh for glass and flax fiber**

Maximal strengh of materials are shown in Table2.

Table 2

Mater	**Max strengh N**
Carbon fiber	9240
Carbon fiber-flax	2580
Glass fiber-flax	2510

Results and discussion

Most strenghtful material has been carbon fiber without any other reinforcements. But as known material as hemp fiber, which is more strenghtful as flax fiber there was no chance to research it and test it, because of that manufacturers which is near are not using fibers for reinforcements but only for food production or heating.

Summary

Results showed that most strength with flax was with carbon fiber but tensile strength difference from glass fiber reinforcement was not big.

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