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BOOK OF ABSTRACTS

MECHANICS OF COMPOSITE MATERIALS

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DESIGN OF ADHESIVE JOINTS WITH DIFFERENT ELASTIC PROPERTIES

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The single-lap joint is the most general joint used mainly due to its simplicity and efficiency. However, a significant disadvantage of adhesive joints is the fact that the high stress concentration is located at the ends of the overlap. Elimination or softening this concentration is one of the main objectives in the design of adhesive joints. One way of solving this problem is the construction of a joint, in which the adhesive along the length of the bonding has a different modulus [1]. A flexible and ductile adhesive is placed at the ends of the overlap and a rigid and brittle adhesive is placed at the centre of the overlap. This scheme allows redistribute stress along the length of bonding and reduces the high stress concentration at the ends overlap.

The aim of this work is to investigation of the effect on strength and fracture toughness of single-lap joint on location of flexible and ductile and a rigid and brittle adhesive along the length of the bonding.

The rigid and brittle adhesive used in the present work was the epoxy resin system Sikadur®-52 with tensile modulus 1900 MPa and ductile and a flexible adhesive was 2 component polyurethane adhesive Bison with tensile modulus 900 MPa.

The fracture toughness in bonded joints was determined using the linear elastic fracture methods according to ASTM D 3433 standard. The opening-mode fracture toughness G_{Ic} of joint with neat Sikadur®-52 was from 167 to 182 J/m^2, and joint with flexible, ductile adhesive 2 component polyurethane adhesive Bison placed at the ends and rigid, brittle adhesive (Sikadur®-52) placed at the centre of the overlap was from 193 to 211 J/m^2. Strength of the joints was determined on specimens with lap joints in accordance with ASTM D 1002. The average shear strength of the joint with a neat Sikadur ® -52 was 12.3±4 MPa, while the strength of the joint with Sikadur ® -52 placed at the centre of the overlap and 2 component polyurethane adhesive Bison 2 component polyurethane adhesive Bison placed at the ends was 19.8±4 MPa.

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