Title

ELASTIC PROPERTIES AND STRENGTH OF COMPOSITE PLATE REINFORCED BY KNITTED FABRICS

Abstract text

Fibers are bridging the crack. Fiber pulling out micro mechanics is governing the macro-crack opening process in short fiber composite material. Post cracking load –bearing capacity is dependent on the each single fiber as well as fibers bundle pull-out process. In the present work numerical simulation and experimental investigation of a single elasto-plastic fiber (metallic, polymer) was embedded into elastic matrix (epoxy, concrete) and was subjected to external applied pulling load is presented. Three different fiber's geometries were observed. Fiber embedment length as well as angle to pulling out force was varied. Numerical modeling was performed using 3D FEM approach. Numerical FEM calculations were performed for such three failure steps as: a) fiber pull-out with perfect bond between fiber and concrete matrix; b) fiber pull-out with partial debond (cylindrical crack) between concrete matrix and fiber, started from concrete matrix surface; c) fully debonded fiber pull-out of concrete matrix. Particular attention was focused on single fiber pulling out of concrete with accidental small sand grain (or grains) existing in matrix channel between fiber and matrix surfaces. Pull out experiments were performed for steel, polymer or composite fibers pulling out of polymer (or concrete) matrix. Simulations results were compared with experimental data. Comparison was allowed to obtain numerical values for micro mechanical process- friction coefficients on the fiber/matrix interface during fiber sliding motion with friction out of concrete (or epoxy) matrix. Simplified fiber pull out mechanical model was elaborated. Single fiber pulling out low was used for macro crack opening prediction in short fiber composite structure subjected to mechanical loading.

Keywords

FIBER, ELASTIC, PLASTIC, PULL-OUT, FRICTION, FAILURE

Authors 4

KRASNIKOVS, ANDREJS (RIGA TECHNICAL UNIVERSITY // TRANSPORT AND MECHANICAL ENGINEERING)

KONONOVA, OLGA (RIGA TECHNICAL UNIVERSITY // TRANSPORT AND MECHANICAL ENGINEERING)

KHABBAZ, AMJAD (MAJMAAH UNIVERSITY // CIVIL ENGINEERING)

VARNA, JANIS (LULEA TECHNICAL UNIVERSITY // ENGINEERING SCIENCES AND MATHEMATICS)