The calculation of the lower boundary of the limit load for multilayered fibre composites under biaxial loading

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A method of calculation of strength characteristics of multilayer composite materials with various schemes of reinforcing under biaxial loading is proposed. The criterion of maximum stress is fulfilled for the fibre unidirectional ply within multilayer composites. The main attention is paid to the calculation of the lower bound of the limit load on the basis of the static theorem of the limit equilibrium method. The problem of calculation of the limit load is considered as a task of linear programming. Numerical solution of the problem is proposed. By the method of the inequalities analytical solutions were obtained for particular cases. Analytical solutions can be obtained for composites with a complicated scheme of reinforcement when using the filament model unidirectional fibrous composite. A model in which the load carrying capacity of the ply under pure shear in the reinforcement plane is not taken into account is proposed. The analysis of the strength characteristics of various composites has been carried out. Such composites as multilayered glass-, carbon fiber reinforced plastics with different reinforcement schemes are considered. Limit curves were obtained, which are in good agreement with known experimental data.

Keywords: *multilayered composite materials, limit load, linear programming, criterion of maximum stresses*

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