

Numerical modeling of nonlinear transversal behavior of a para-aramid yarn

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Abstract

This paper presents a numerical microscopic investigation on transversal behavior of an aramid yarn. Interactions with frictions between single fibers in a yarn have been taken into account. To validate numerical calculation, a bloc of about 36500 single fibers was studied in the case of a transversal compression using assumption of plane strain. Results showed that the transversal behavior of yarn is highly non-linear. Transversal modulus of yarn depends on loading. A nonlinear behavior model was proposed for an equivalent homogeneous material. Dependence of the two parameters of this latter on microstructure of yarn is discussed.

Keywords: Para-Aramid yarn, transversal mechanical behavior, dynamic compression, FEM analysis, equivalent material