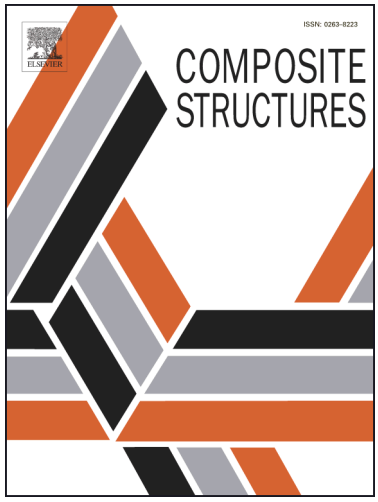

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The effect of partial exfoliation of multilayer silicate filler particles on the elastic properties of a polymer composite

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Abstract

A method for stepwise calculation the elastic constants of a three-phase composite, including the polymer matrix, the fully exfoliated silicate nanolayers and the platelike silicate particles in the form of multilayer intercalated stacks is considered. A theoretical analysis is carried out by using the Mori–Tanaka theory of an equivalent medium. The influence of degree of exfoliation (the ratio of exfoliated filler content to the total filler content) on the reinforcing efficiency is studied and discussed. A comparative analysis of experimental data of elastic modulus for a rigid polyurethane/ montmorillonite composite and prediction results is carried out. It is shown, that with growing content of montmorillonite in the composite, the degree of exfoliation of its layered particles essentially decreases, and particles in the form of multilayer stacks appear.

Keywords: polymer/silicate composite, multilayer particles, partial exfoliation, modeling, elastic constants

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