

A Novel Geometrical Approach toward the Mechanical Properties of Particle Reinforced Composites

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Abstract : Many investigations on the micromechanical structure of materials indicate that there exist fractal patterns at the micro scale in some of the main construction and industrial materials. A recently presented micro-fractal theory brings together the well-known periodic homogenization and the fractal geometry to construct an appropriate model for determination of the mechanical properties of particle reinforced composite materials. The proposed multi-step homogenization scheme considers the mechanical properties of different constituent phases in the composite together with the interaction between these phases throughout a step-by-step homogenization technique. In the proposed model the interaction of different phases is also investigated. By using this method the effect of fibers grading on the mechanical properties also could be studied. The theory outcomes are compared to the experimental data for different types of particle-reinforced composites which very good agreement with the experimental data is observed.

Keywords : fractal geometry, homogenization, micromechanics, particulate composites

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