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Modeling the deformation of materials with stochastic fractal microstructure M.A. SOARE, R.C. PICU, Rensselaer Polytechnic Institute — Many materials with heterogeneous multiscale fractal structure are found in nature. Examples include biological tissues and bone, some rock such as sandstones, and aero-gels. In such materials the amount of geometrical detail observed in the microstructure increases from scale to scale in a self-similar manner, they lack characteristic length scales and the Hausdorff dimension is smaller than that of the embedding space. Furthermore, the microstructure is multiscale and stochastic, in the sense that the generating operators that map the geometry from one scale to the next are stochastic. In this work, we develop a method by which boundary value problems can be solved for these complex multiscale materials with minimal computational effort. Use is made of the scaling properties of the geometry and of stochastic finite elements in which the solution is approximated using chaos polynomials. The talk will review the formulation and a number of examples used for verification.

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