Fractional Calculus Approach to Dynamic Problems of Viscoelastic Materials

Nobuyuki SHIMIZU, Wei ZHANG

キーワード: Fractional Calculus, Viscoelasticity, Constitutive Law, Creep, Relaxation, Vibration, Damping

1999年 42巻 4号 p. 825-837

DOI https://doi.org/10.1299/jsmec.42.825

抄録

This article presents a review on the application of the fractional calculus to viscoelasticity. There are several methods to treat viscoelasticity of viscoelastic materials. One such method is to use the fractional derivative model for describing the constitutive relation of the materials. The application of the fractional operator in this field, the Riemann-Liouville's fractional operator is emphasized among several definitions of the fractional operator. The survey suggests that the viscoelastic constitutive models incorporating with the fractional calculus have been well established for fairly wide range of viscoelastic materials and the advantages of adopting the fractional calculus in viscoelasticity are that the constitutive relation of some viscoelastic materials can be described accurately by the fractional calculus model with a few experimental parameters, and that the fractional calculus approach can lead to well-posed problems even when incorporated into the finite element formulation.

データが取得できませんでした。
The fractional calculus numerical algorithms and its application to the viscoelastic material problem. Ai-Min Yang1,2*, Ling Zhang1, Xiao-Jun Men1, Yi-Jun Zhou3 and Ying Jiao3. 1College of Science, Hebei United University, Tangshan, China 2College of Mechanical Engineering, Yanshan University, Qinhuangdao, China. This paper studied the fractional calculus, given three types of numerical methods of solving fractional differential equations, that is the Fractional Euler method, The Fractional Backward differential method(BDF method) and the Fractional Order Reduced Backward differential method(FORBDF method).