OPEN ACCESS Freely available online

ISSN: 2168-9873
Journal of Applied Mechanical Engineering

Perspective

Viscoelastic Behavior of Engineering Materials

Kamil Zurik*

Department of Mechanical Engineering, Bialystok University of Technology, Bialystok, Poland

DESCRIPTION

In materials science and continuum mechanics, viscoelasticity is the property of materials that exhibit both viscous and elastic characteristics when undergoing deformation. Viscous materials, like water, resist shear flow and strain linearly with time when a stress is applied.

Viscoelastic materials are those for which the relationship between stress and strain depends on time or, in the frequency domain, on frequency. The slope of a plot of stress vs. strain depends on strain rate. An elastic solid represent a subset of viscoelastic materials they have a unique equilibrium configuration and ultimately recover fully after removal of a transient load. After being squeezed, they return to their original shape, given enough time

When polymeric materials are stressed, their behaviour varies widely from one material to the next and is also greatly influenced by temperature. Thermoplastic materials and thermosets are brittle elastic solids below their glass transition temperatures, but thermoplastics show viscoelastic behaviour above glass transition. The deformation under stress in a viscoelastic material is time-dependent, and creep can happen. In such a material, there can also be relaxation, or a reduction in stress over time while under constant strain. The fact that parameters like modulus, strength, and ductility are functions of time and rate of strain is a result of viscoelasticity.

The applied stress causes an initial elastic strain followed by a viscous, time-dependent strain, resulting in viscoelastic behaviour. Creep under constant load, time-dependent recovery of deformation followed by load removal, stress relaxation under constant deformation, and time-dependent creep rupture are all examples of viscoelastic behaviour of a material. The length and rate of loading have a significant impact on the deformation of polymeric materials. As the temperature approaches it becomes more crucial.

The idea of viscoelasticity is introduced, as well as some of the material behaviours of viscoelastic materials, such as strain rate dependence, stress relaxation, creep, hysteresis, and preconditioning. The behaviour of viscoelastic materials is compared to that of elastic solids and viscous fluids. Students learn about viscoelastic materials as well as the relevance of engineers comprehending viscoelasticity.

Engineers must understand how the materials they choose will react to the stresses that the gadgets will encounter when designing them. Because some materials are viscoelastic, engineers must identify them and understand their properties. Bioengineers are also interested in biological materials and how they work in both healthy and pathological states. Because biological materials are viscoelastic, bioengineers must understand how they behave in order to fully characterise their behaviour. Engineers must also understand the surroundings in which their devices will operate as part of the process to ensure effective and successful performance. When building a device to operate on viscoelastic materials in the human body, for example, an engineer must consider how the environment will react to the forces produced by the device.

A solid is a material with structural stiffness and resistance to shape and volume change. Solids, in other words, keep their shapes and do not conform to their surroundings. A fluid is a substance that flows to confirm to its containers shape. Depending on the forces applied to the substance, silly putty behaves like an elastic solid or a viscous fluid. When you place silly putty in a container, it deforms over time to fit the shape of the container. When the silly putty is stretched too far, it exhibits a well-defined failure comparable to elastic solids. This is referred to as viscoelastic behaviour.

Many materials exhibit viscoelastic properties. Polymers and biological materials are the two types of materials that they belong to. A polymer is a material made up of a component that is repeated to form a chain at the molecular level. Plastics and rubbers are two of the most common polymers. Although many biological materials are classified as polymers due to their architecture, they are still considered living things. The viscoelastic behaviour of polymers and biological materials is similar.

Correspondence to: Kamil Zurik, Department of Mechanical Engineering, Bialystok University of Technology, Bialystok, Poland, E-mail: kzurik@pb.edu.pl

Received: 30-Mar-2022, Manuscript No. JAME-22-16722; **Editor assigned:** 01-Apr-2022, Pre QC No. JAME-22-16722 (PQ); **Reviewed:** 15-Apr-2022, QC No JAME-22-16722; **Revised:** 22-Apr-2022, Manuscript No. JAME-22-16722 (R); **Published:** 02-May-2022, DOI: 10.35248/2168-9873.22.11.413.

Citation: Zurik K (2022) Viscoelastic Behavior of Engineering Materials. J Appl Mech Eng. 11:413.