

Glossary of Rheological terms

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- applied mathematics
- bibloggy
- building science
- fluid mechanics
- food science
- metallurgy
- paint
- petroleum
- plastics.

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Foreword

The term rheology was defined as “the science of the deformation and flow of matter” at the inaugural meeting of the (American) Society of Rheology in Washington, D.C. in 1929. This definition has been used as a guide in the selection of terms for inclusion in this glossary. In the ensuing forty years, many new phenomena have been discovered and new technical terms have been required. The council of the British Society of Rheology approached the British Standards Institution in order that a British Standard glossary might be drawn up.

In compiling this glossary the following guidelines have been adopted:

- a) Terms used in other disciplines that can be found in general technical dictionaries have usually been omitted.
- b) Mathematical equations have been used only where it was unavoidable.
- c) Definitions have been prepared so as to retain the rheological significance of the term while being compatible with the usage in as many other disciplines as possible.

Use was made of the following publications in the preparation of this glossary.

REINER, M. and SCOTT BLAIR, G. W., Rheological terminology. Chapter 9 in “Rheology; theory and applications”. (ed.) EIRICH, F. R., vol. 4. Academic Press Inc., 1967.

STANDARDS ASSOCIATION OF AUSTRALIA. Glossary of terms and classification of properties relating to the deformation and flow of materials, 1970. Australian Standard Z61:1970.

LE CONSEIL DU GROUPE FRANÇAIS DE RHÉOLOGIE. Dictionnaire Rhéologique, Société de Diffusion des Techniques du Batiment et des Travaux Publics, 1968.

The terms in this glossary have been listed in alphabetical order. Where a number of terms share the same definition the preferred term is listed first in bold type with the alternative terms in smaller type underneath it.

The alternative term also appears alphabetically in the list, also in smaller type. These alternative terms are not deprecated unless this is stated beside the term. Where alternative terms have been considered to be of equal merit they have been defined separately.

Terms used in definitions that are also defined in this glossary are printed in italics.

NOTE General cross references to related terms have been given under the following terms:

model
modulus
viscosity.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 15 and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

Term	Definition
activation energy	The additional energy which molecules require above their average kinetic energy in order to permit a particular process to occur.
adhesion	The force that resists the separation of two bodies in contact.
aggregate	A group of particles held together in clumps.
anelasticity	See <i>delayed elasticity</i> .
angle of extinction	The smallest angle between the <i>streamlines</i> and an optic axis of a birefringent flowing liquid (see <i>flow birefringence</i>). The optic axis is determined by maximum light extinction.
angle of isocline	A right angle minus the <i>angle of extinction</i> .
angle of repose	1. The maximum angle between the surface of a heap of loosely piled material and the horizontal. 2. The maximum angle at which a plane can be inclined before a solid body resting on it will move by either rolling or sliding.
anisotropic	Not having the same properties in all directions.
annealing	Heat treatment with the aim of reducing internal <i>stress</i> .
anti-thixotropy	See <i>negative thixotropy</i> .
apparent viscosity	The quotient of <i>shear stress</i> divided by <i>rate of shear</i> when this quotient is dependent on the rate of shear.
areal viscosity	The property of an interface to resist increasingly an <i>isotropic</i> change in area with increase in the rate of change.
Barus effect	See <i>die swell</i> .
Bauschinger effect	The lowering of the <i>elastic modulus</i> in a <i>hysteresis</i> experiment following the reversal of the applied <i>stress</i> , which produced <i>plastic deformation</i> .
Bingham model Bingham body, <i>deprecated</i>	A <i>model</i> with the behaviour of an <i>elastic solid</i> up to the <i>yield stress</i> ; above the yield stress the <i>rate of shear</i> is directly proportional to the <i>shear stress</i> minus the yield stress.
body	1. A subjective assessment of <i>consistency</i>. 2. See <i>model</i>; this use is deprecated, e.g. <i>Bingham body</i>.
body force	A force that acts through the whole volume of the system.
Boltzmann's linear superposition principle	The assumption that responses are additive, e.g. that the <i>stress</i> resulting from the sum of several <i>deformations</i> , each a function of time, is the sum of the stresses resulting from the separate deformations.
brittle fracture	A fracture under conditions of little or no previous <i>plastic deformation</i> .
bulk modulus	The quotient of the <i>isotropic stress</i> divided by the <i>elastic volume strain</i> . The reciprocal of <i>compressibility</i> (2).
bulk viscosity volume viscosity	The <i>viscosity</i> (2) associated with changes in volume, i.e. the quotient of <i>isotropic stress</i> divided by <i>volume strain rate</i> .
Burgers model	A combination of a <i>Kelvin model</i> and a <i>Maxwell model</i> in series.
Cauchy strain engineering strain	The ratio of a linear extension to the original length.

Term	Definition
chemorheology	The study of time-dependent phenomena in <i>flow</i> behaviour resulting from chemical changes. Examples are the <i>shear</i> (1) degradation and cross-linking of polymers.
circular Couette flow	<i>Shear flow</i> in the annulus between two co-axial cylinders in relative rotation; often used without the adjective circular (see <i>Couette flow</i> and <i>plane Couette flow</i>).
coefficient of cross-viscosity	The second order <i>normal stress</i> coefficient of a <i>Reiner-Rivlin fluid model</i> . Strictly not a <i>viscosity</i> .
coefficient of fluidity	The reciprocal of the coefficient of <i>dynamic viscosity</i> (1).
coefficient of friction	The ratio of the frictional force to the normal load between <i>solid</i> bodies.
coefficient of interfacial viscosity	The constant value of the quotient of the force per unit length acting along a line lying in the plane of the interface divided by the <i>rate of shear</i> in the plane of the interface for <i>steady flow</i> . Its dimensions are the same as those of <i>viscosity</i> times length.
coefficient of viscosity	The constant value of the quotient of the <i>shear stress</i> divided by the <i>rate of shear</i> for <i>steady flow</i> characteristic of <i>Newtonian fluid model</i> behaviour [commonly referred to as <i>viscosity</i> (2) or <i>dynamic viscosity</i> (1), compare <i>apparent viscosity</i>].
coefficient of viscous traction	The constant value of the quotient of the tensile <i>stress</i> divided by the rate of extension applied for <i>Newtonian fluid model</i> behaviour.
cohesion	The attraction between the molecules forming the mass of a <i>liquid</i> or a <i>solid</i> .
complex compliance	The mathematical representation of a <i>compliance</i> as being the sum of a real and an imaginary part. The real part is sometimes called <i>storage compliance</i> and the imaginary part <i>loss compliance</i> .
complex modulus dynamic modulus	The mathematical representation of a <i>modulus</i> as being the sum of a real and an imaginary part. The real part is sometimes called <i>storage modulus</i> and the imaginary part <i>loss modulus</i> .
complex viscosity	The mathematical representation of a <i>viscosity</i> (2) as being the sum of a real and an imaginary part. The real part is usually called <i>dynamic viscosity</i> (2), the imaginary part is related to the real part of the <i>complex modulus</i> .
compliance	The quotient of <i>strain</i> divided by its corresponding <i>stress</i> . The reciprocal of <i>elastic modulus</i> .
compressibility	1. The relative volume decrease caused by an increase of pressure. 2. The reciprocal of <i>bulk modulus</i> .
consistency	A general term for the property of a material by which it resists permanent change of shape.
constitutive equation equation of state rheological equation	An equation relating <i>stress</i> , <i>strain</i> , time and sometimes other variables, such as temperature. Also called <i>rheological equation of state</i> .
continuum rheology	The <i>rheology</i> that treats a material as a continuum without explicit consideration of microstructure. Also called <i>macrorheology</i> and <i>phenomenological rheology</i> .
Couette flow	<i>Shear flow</i> in the annulus between two co-axial cylinders in relative rotation. Also called <i>circular Couette flow</i> . (See <i>plane Couette flow</i> .)