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Australian Standard®

Rheology—Glossary of terms and classification of properties

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Australian Society of Rheology
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CSIRO, Division of Forestry and Forest Products
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PREFACE

This Standard was prepared by the Standards Australia Committee on Rheology, under the direction of the Chemical Standards Board, as a major revision of AS Z61—1970, *Glossary of terms and classification of properties relating to the deformation and flow of materials*. The classification system used in AS Z61 has been replaced by a system which allows terms to be assigned to materials which show particular rheological behaviour.

In its preparation, reference was made to definitions of rheological terms from various sources, in particular BS 5168:1975, Glossary of rheological terms.

CONTENTS

FOREWORD

The prime purpose of this Standard is to promote uniformity in terminology used in research reports and industrial documentation relating to the deformation and flow properties of liquid and solid materials.

Deformation and flow properties are most important in the use of natural and manufactured products, and many industries must evaluate and control these properties during manufacture or processing. The rheological behaviour of materials is often complex; results of measurements made on different instruments may therefore not be comparable. The quantities required to be known or controlled are often ill-defined, and different industries follow different traditions. Standard systems of rheological nomenclature have been proposed in various countries and discussed at international level, but none has yet gained global acceptance. In the absence of international agreement, it is desirable that uniformity of terminology be maintained in Australia.

The Standard is divided into three sections. Section 1 gives definitions of terms relevant to the properties of fluids and solids under conditions of deformation and flow. Section 2 lists some SI units relevant to rheological measurements. Section 3 outlines a scheme for classifying fluid and solid materials according to the rheological properties they exhibit when subjected to specified tests.

The definitions are based on what is known through existing experimental data and are not tied to theories on the microstructure of materials. They are arranged in various logical groups to facilitate the location of an appropriate term to describe a known property; an alphabetical index is also provided. Widely, but not exclusively, used symbols are recommended for some terms. Where more than one term is in common use with the same defined meaning, the preferred term is the one shown in bold type.

The terms listed relate to phenomenological rheology, i.e. to observations and measurements on such a scale that heterogeneities and discontinuities are of insignificant dimensions and may be ignored, the material being treated as if it were a continuum. Thus, similar descriptions may apply to materials having microscopic or molecular structures that differ considerably.

Because of the wide application of rheological terms, it has been found necessary to restrict the definitions to those terms which are in relatively common use. Some terms which have limited application, or which are used only in specific industries, are listed in the alphabetical index, where reference is made to the standard definition to which they are most closely related.

The classification scheme and key allow suitable models and terms to be identified from observed rheological behaviour. The classification is for idealized materials. Real materials can be said to behave like certain ideal bodies for a given time-scale, testing equipment and environmental conditions. If any of these conditions is changed, the properties of the real material may become qualitatively different and may require a different place in the classification.

STANDARDS AUSTRALIA

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SECTION 1 GLOSSARY OF RHEOLOGICAL TERMS

GROUP 1 BASIC DEFINITIONS

No	Term	Definition
1.1 DISCIPLINES		
1-01-01	**rheology**	The study of the deformation of materials, including flow.
1-01-02	**phenomenological rheology**	The rheology that treats a material as a continuum that is characterized by experimental rheological parameters without consideration of the structure of the material.
1-01-03	**microrheology**	The rheology in which account is taken of the structure of materials.
1-01-04	**chemorheology**	Rheology as influenced by chemical changes within the material.
1.2 GEOMETRY		
1-02-01	**principal axes**	Axes of a (tensor) quantity such as stress, strain or strain rate along which there are no tangential components of that quantity.
1-02-02	**normal component**	The component of a vector at right angles to the planar element to which it applies.
1-02-03	**tangential component**	The component of a vector parallel to the planar element to which it applies.
1-02-04	**isotropic**	Having the same properties in all directions.
1-02-05	**anisotropic**	Not having the same properties in all directions.
1. KINEMATICS		
1-03-01	**displacement**	The vector defining the change of position of a point.
1-03-02	**velocity gradient**	The derivative of the velocity of a fluid element with respect to a space coordinate. NOTE: Where the deformation does not include rotation, the velocity gradient is numerically equal to the shear strain rate.
1-03-03	**deformation**	Change of mutual distances or orientations between different points of a body.
1-03-04	**deformation gradient**	The derivative of the deformation at a point with respect to a space coordinate.
1-03-05	**shear deformation**	A deformation that changes the shape, but not the volume, of the body. NOTE: A deformation may combine a shear deformation with a change of length or volume.
1-03-06	**pure shear deformation**	A shear deformation without rotation.
1-03-07	**simple shear deformation**	A shear deformation consisting of parallel relative displacements of parallel cross-sections of the body. NOTE: A simple shear deformation is the sum of a pure shear deformation and a rotation.
1-03-08	**torsion**	The deformation of a body, in which parallel cross-sections are rotated relative to each other.
1-03-09	**elongation**	Increase in length.
1-03-10	**strain**	Deformation relative to a reference configuration. Symbol: ε