46: Standards for Polymer Testing

G. M. Swallowe

There are three main types of standards 1) Measurement standards 2) Product specification standards and 3) Systems standards. Measurement standards are designed to ensure consistency in measurement and are maintained by National Laboratories where reference standards and calibrated measuring instruments are kept. These are used to provide the standards against which calibration service providers can refer their instruments and in order to provide a national calibration and certification service. Product specification standards form the largest group of standards and cover materials, testing methods, terminology, safety, dimensions and tolerances etc. The purpose of these specification standards is to provide a means of ensuring compatibility and objective comparisons between different materials and products. Systems standards cover such aspects as how to maintain and install equipment, quality inspection etc. From the point of view of this volume the most relevant standards are the group loosely defined as product specification standards. These will include standard tests for strength, ductility, thermal properties etc. Use of these standard test methods not only provides information which enables comparisons between different materials to be made but also comparisons between batches of nominally the same material from different manufacturers.

STANDARDS ORGANISATIONS

Most countries have their own standards organisations and there are now over 100 standards organisations in existence, the oldest being the British Standards Institution. The ISO (International organisation for Standards) exists to work towards harmonising world standards and the EC has its own standards organisation CEN whose primary aim is to harmonise standards throughout the EC. From a practical point of view the most important standards for polymer testing are those issued by the ASTM (American Society for Testing and Materials), the ISO, CEN, DIN (Deutsches Institut fur Normung) and BSI (British Standards Institute). Standards contain details of the test methods, the dimensions of the samples that should be used, as well as a recommended number samples to test and the method of presenting the results. Included also is usually a method for conditioning samples prior to testing or a reference to a further standard for conditioning samples. ASTM standards frequently contain representative measurements from several laboratories. Specific standards are numbered with a system of letters and numbers, the letters indicating the originating standards organisation and the numbers the standard number. Lists of standards are published annually by the main standards organisations and, when required, standards are reviewed, updated or replaced. Many standards are now comparable between the different organisations and will have numbers such as BS ISO 871 which indicates both a British and International standard.
(in this case for the determination of the ignition temperature of plastics). The ASTM publishes tables of equivalencies between ASTM and ISO standards. Many standards are specific to a particular polymer or form of polymer product and the number of specific polymer standards runs into many hundreds. Listed below is a selection of the more relevant general ASTM and BSI standards from the point of view of polymer mechanical testing. However these represent only a small fraction of polymer standards. For a comprehensive listing readers should consult the annual listings of their standards available from the standards organisations at the addresses listed at the end of this article.

ASTM D256  Determining the Impact Resistance of Notched Specimens of Plastics
ASTM D618  Standard Practice for Conditioning Plastics for Testing
ASTM D638  Test Method for Tensile Properties of Plastics
ASTM D695  Test Method for Compressive Properties of Rigid Plastics
ASTM D746  Brittleness Temperature of Plastics and Elastomers by Impact
ASTM D785  Test Method for Rockwell Hardness of Plastics
ASTM D883  Terminology Relating to Plastics
ASTM D1004 Initial tear resistance of Plastic Film and Sheeting
ASTM D1043 Stiffness Properties of Plastics as a Function of Temperature
ASTM D1242 Resistance of Plastic Materials to Abrasion
ASTM D1708 Tensile Properties of Plastics by use of Microtensile Specimens
ASTM D2990 Tensile, Compressive, and Flexural Creep and Creep Rupture
ASTM D3028 Kinetic Coefficient of Friction of Plastic Solids
ASTM D4092 Terminology Relating to Dynamic Mechanical Measurements on Plastics
ASTM D4812 Unnotched Cantilever Beam Impact Strength of Plastics
ASTM D5023 Dynamic Mechanical Properties of Plastics Using Three Point Bending
ASTM D5024 Dynamic Mechanical Properties of Plastics in Compression
ASTM D5026 Dynamic Mechanical Properties of Plastics in Tension
ASTM D5045 Plane Strain Fracture Toughness and Strain Energy Release Rate
ASTM D5420 Impact Resistance of Flat, Rigid Plastic Specimen by Means of a Striker Impacted by a Falling Weight
ASTM D5628 Impact Resistance of Flat, Rigid Plastic Specimen by Means of a Falling Dart
ASTM D5936 Specification for Multipurpose Test Specimens Used for Testing Plastics
ASTM D5938 Guide Describing the General Principles for Determination of Tensile Properties of Plastics
ASTM D5941 Determining the Izod Impact Strength of Plastics
ASTM D5942 Determining the Charpy Impact Strength of Plastics
ASTM D5943 Determining Flexural Properties of Plastics

BS 2782 Methods of Testing Plastics: This is a multi-component standard consisting of over 200 separate test methods covering the Thermal, Electrical, Mechanical, Chemical, Optical, Rheological and Other Properties of Polymers.