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Application Data Sheet

No. 9

Autograph Precision Universal Tester

Material Testing & Inspection

Measurements of Modulus of Elasticity and Poisson's Ratio for Films

Standard Nos. ISO527-3: 2012 (JIS K 7127: 1999)
ISO527-1: 2012 (JIS K 7161: 1994)

Introduction

Tensile tests are widely used to evaluate plastic materials, and the results are used as indices for new materials development and for implementing quality control. Items evaluated as tensile characteristics of plastic materials include the tensile modulus, Poisson's ratio, strength, and break strain. With films, there are no standards specified with respect to test methods for the tensile elastic modulus and Poisson's ratio, yet there are demands for measurements of these values. In this Data Sheet, measurements of the tensile modulus and Poisson's ratio were performed for a PET film based on elongation and width data acquired using a non-contact type extensometer/width sensor.

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Measurements and Jigs

Non-contact type extensometers/width sensors capable of fine displacement measurements without affecting the sample properties are required to accurately obtain the tensile modulus and Poisson's ratio for a film. In measuring such physical properties, the sample must be gripped evenly, suppressing the occurrence of wrinkles, so it is important to choose the grips carefully. The use of a non-contact type extensometer/width sensor and foil grips is recommended for film tensile tests.

Measurement Results

Fig. 1: Test Status

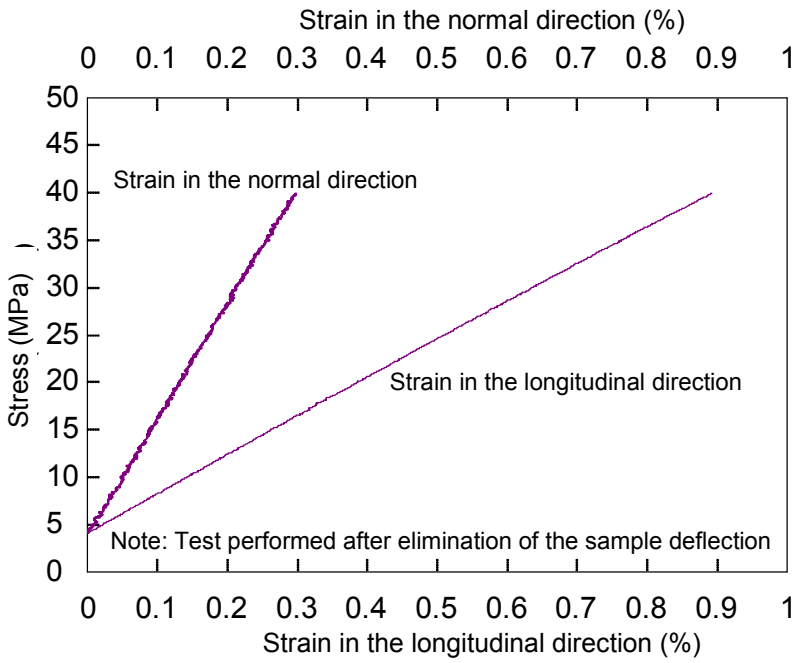

Fig. 2: Relationship Between Stress and Strain

Table 1: Test Conditions

Item	Set Value
Test Speed	1 mm/min
Initial distance Between Grip	100 mm
Gauge Length	40 mm

Table 2: Test Results

Sample	Thickness (μm)	Tensile Modulus (MPa)	Poisson's Ratio
PET Film	25	4139	0.37

Young's Modulus Measurement System for Film

Tester:	AG-Xplus
Load Cell:	1 kN
Test Jig:	1 kN grips for foils
Extensometer:	TRViewX 55S non-contact extensometer/width sensor
Software:	TRAPEZIUM X (Single)

AG-Xplus Table-Top Precision Universal Tester

Features

- A high-precision load cell is adopted. (The high-precision type is class 0.5; the standard-precision type is class 1.) Accuracy is guaranteed over a wide range, from 1/1000 to 1/1 of the load cell capacity. This supports highly reliable test evaluations.
- Crosshead speed range
  Tests can be performed over a wide range from 0.0005 mm/min to 1,500 mm/min.
- High-speed sampling
  Ultrafast sampling, as fast as 0.2 msec. Sudden changes in test force, such as when brittle materials fracture, can be assessed.
- TRAPEZIUMX X operational software
  Designed for intuitive operation, this software offers excellent convenience and user friendliness.
- Smart controller
  Real-time test force and position data is readily confirmed, and the manual dial can be used for fine adjustments to jig positioning.
- Optional Test Devices
  A variety of tests can be conducted by switching between an abundance of jigs in the lineup.

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