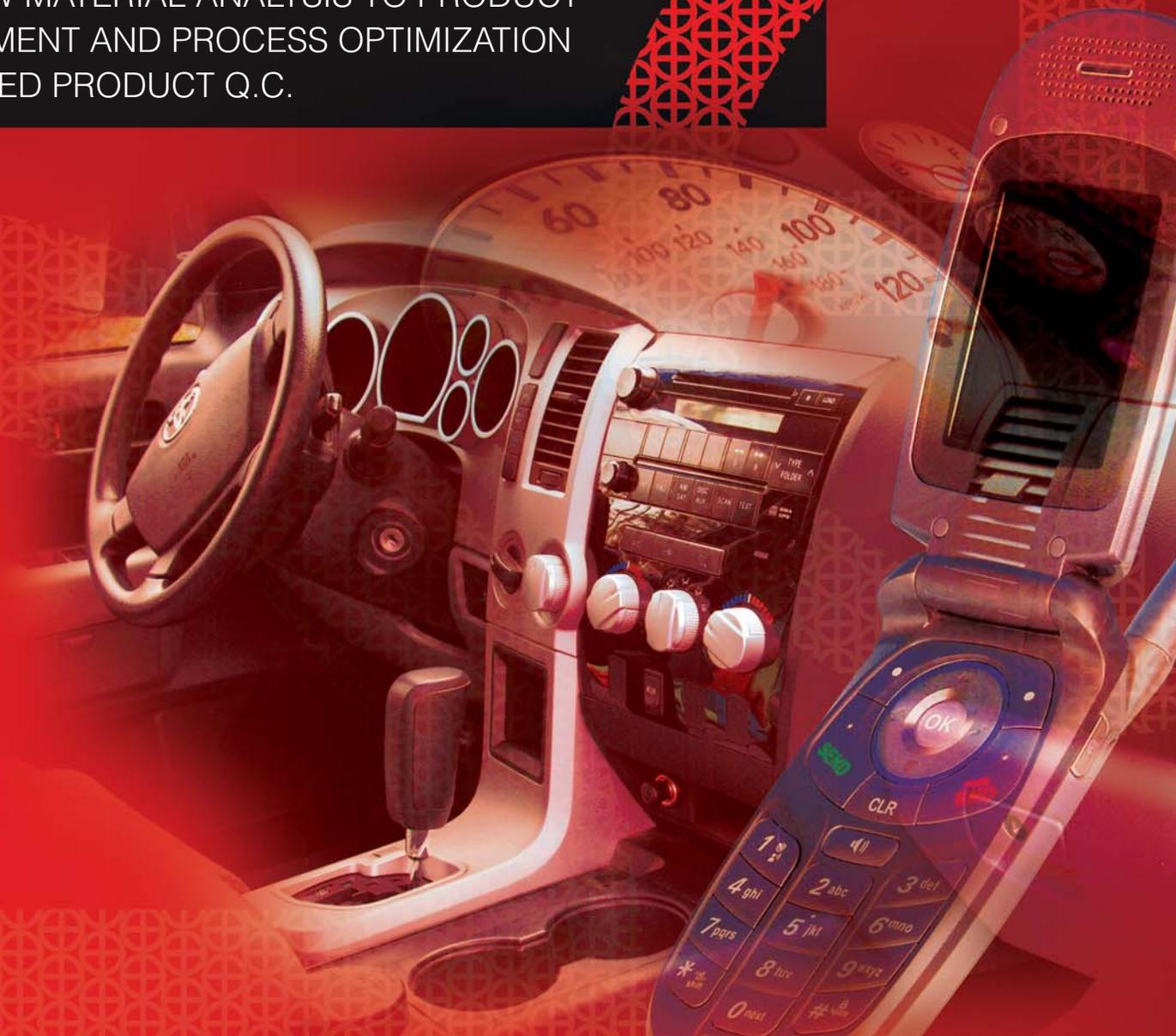
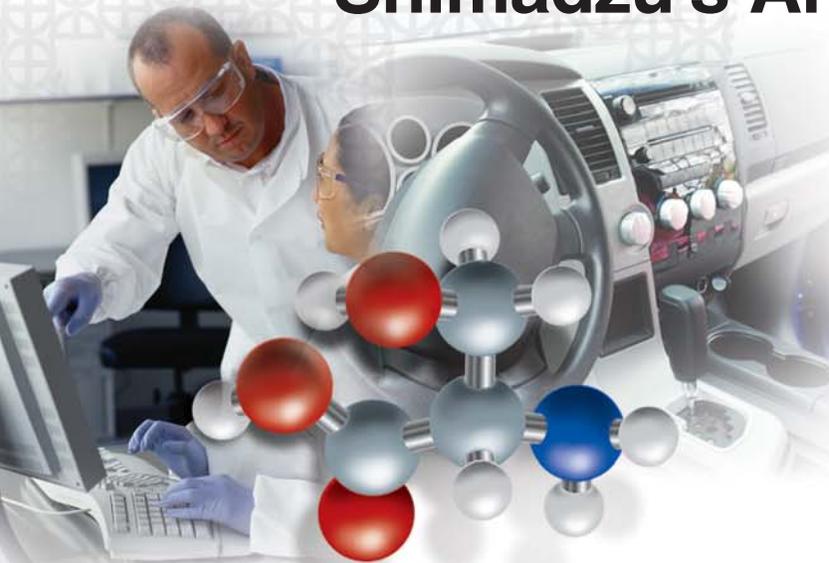


Analytical and Measurement Solutions for Polymers

FROM RAW MATERIAL ANALYSIS TO PRODUCT
DEVELOPMENT AND PROCESS OPTIMIZATION
TO FINISHED PRODUCT Q.C.



Shimadzu's Analytical and Measuring



Plastic products and components are used in countless areas for a wide range of purposes. Whether a container for household products and foodstuffs to the inclusion in automobiles and electronic devices, plastics play an important role in the lives of virtually everyone. The assurance of the safety, quality, and reliability of your plastic products requires that you monitor every step of the development and manufacturing process. Shimadzu offers a complete selection of high-quality physical testing and chemical analysis instrumentation to ensure that your products meet the highest performance standards.

Determination of Viscosity Properties

Capillary Rheometer Flow Tester CFT-500D

The CFT Flow Tester is a constant shear stress-type capillary rheometer used mainly for the collection of viscosity data and its effects on various types of polymers. The main features of the CFT are its constant extrusion mechanism, which closely matches that of actual production machinery, and the ability to measure epoxy samples that harden during experimentation without the need to worry about instrument overload.



Analysis and Preparatory Isolation of Additives Plus the Measurement of Molecular Weight Distribution by HPLC

Prominence HPLC

With HPLC, combinations of different stationary phases and mobile phases enable a variety of separation modes. For example, reverse phase chromatography can be used for the separation and quantitative determination of components with a relatively low molecular weight, such as additives. Normal phase size exclusion chromatography can be used for the measurement of the molecular weight distribution of large polymer compounds. Also, fractionating the eluate from the separation column enables the preparative purification of specific components in sample mixtures.



Instruments for Working with Polymers

Analysis of Fusion, Crystallization, Thermal Decomposition, and Viscoelasticity

60 Series Thermal Analyzers

Shimadzu's 60 Series is ideal for the evaluation of a number of thermal properties, including specific heat capacity and coefficient of thermal expansion/contraction. Utilizing an integrated balance assembly that enables easy, accurate simultaneous TG/DTA analysis, the DTG-60 can be used to obtain information on the thermal characteristics and properties of polymers. The DSC-60 Differential Scanning Calorimeter provides information on glass transition, melting point or any heat reaction, while the TMA-60 uses a high-precision technique to provide information on the mechanical properties of the materials.



Qualitative and Structural Analysis of Main Components

FTIR Spectrophotometers

Ideal for high-precision infrared analysis to confirm, identify, and detect foreign matter in raw materials, medical products, packaging, and coatings, the IRPrestige-21 features a S/N ratio of 40,000:1 and expansion capabilities to the Near IR and Far IR ranges. Superior to general-purpose instruments, the IRAffinity-1 delivers the highest sensitivity in its class. These powerful instruments feature long-term stability, protection from humidity, and increased reliability with self-diagnostics at initialization and continuous monitoring during operation.



UV-Vis Spectrophotometers

UV-Vis spectrophotometry provides a convenient solution for a number of polymer analysis requirements including copolymer composition, polymer additives, and colorimetry. Shimadzu offers a wide selection of robust, easy-to-operate UV-Vis spectrophotometers to meet most laboratory needs. Boasting the highest resolution (1 nm) and the smallest footprint of all compact UVs in its class, the UV-1800 delivers high performance and the ability to transfer data to USB memory. Superbly engineered for demanding applications, the UV-2550 and the UV-2450 are ideal for resolving an array of sample types.



Advanced Mass Spectrometry Enables More Efficient Polymer Analysis and Better Control During Synthesis

Identification of Unknown Polymer Additives by LCMS-IT-TOF

LCMS-IT-TOF Mass Spectrometer

Identification of the additives used in polymer materials becomes important for adjusting product characteristics. Accurate mass measurement using MS with the LCMS-IT-TOF mass spectrometer can quickly narrow the composition formula candidates to just the most likely compounds.



Analysis of Polymers and Determination of Molecular Weight by MALDI-TOF MS

GPC-MALDI TOF Fully Automated Platform

MALDI MS is a widely used method for the analysis of synthetic polymers. However, in complex mixtures, the minor components may not be detected due to ion suppression by more abundant species also present in the sample. By combining a high-resolution Gel Permeation Chromatography (GPC) system and an AXIMA series MALDI-TOF mass spectrometer with the redesigned AccuSpot, a fully automated fraction collection and spotting device, Shimadzu has eliminated this issue. This platform enables quick, more detailed analysis of trace components, helps detect substances that can affect material characteristics, eliminates the uncertainty associated with manual processing, and allows considerable time savings.



Analysis of Composition, Molecular Structure, Thermal Stability, and Thermal Decomposition Mechanisms/Structures

GCMS-QP2010 Pyrolysis Measurement System

With pyrolysis-gas chromatography (Py-GC), nonvolatile components and substrate polymers can be analyzed. The instantaneously thermally decomposed fragments are separated with a GC capillary column, and then each component is identified with the mass spectrometer. In addition, with the evolved gas analysis (EGA) method, it is possible to analyze the various components in the vapor phase when the samples are heated. Major volatile products in the pyrolysis effluent can also be identified and quantified by TGA-GCMS.



Detection and Identification of Elements with X-ray, AA, and ICP Analysis

Analysis of Elements and Foreign Matter

Energy Dispersive X-Ray (EDX) Fluorescence Spectrometer

Shimadzu's EDX Series offers enhanced performance capabilities for elemental determination in a wide range of demanding applications, including regulatory compliance measurement such as RoHS and EV.



Quantitative Elemental Analysis

Atomic Absorption Spectroscopy

Shimadzu offers a series of AA spectrophotometers with exceptional performance, flexibility, and value. We have worked closely with engineers and scientists in the polymer industry to thoroughly understand the complexities of analysis required at each stage of development, production, and quality control as well as EPA and RoHS compliance for disposal regulations.



ICPE-9000 Multitype ICP Emission Spectrometer

The simultaneous ICPE-9000 can be used in application stages for a wide range of high-precision analytical assessments in research and development, environmental management and low-to-high-concentration component analysis. The ICPE-9000 features easy-to-use and innovative ICPEsolution Software which offers an array of features to make analysis simple, accurate, and fast.



Qualitative Analysis of Substances and Measurement of the Lattice Constant, Crystallite Diameter, Crystallinity Calculation, and Degree of Orientation

X-ray Diffractometers

With their basic ease of use and abundant functions, the XRD-6000 and XRD-7000 offer solutions encompassing wide-ranging analysis requirements from routine qualitative and quantitative analysis to state change analysis, including stress analysis, residual austenite quantitation, crystallite size/lattice strain, and crystallinity calculations.



Confirm Mechanical Characteristics During Production and Final Q/C

Strength Measurement of Particles Forming Products Obtained from Raw Materials Using Pulverization and Granulation

Hardness Testers

Shimadzu Micro Hardness Testers are ideal for evaluating small components and surface areas in a wide range of polymer research, quality control, and product certification applications. These easy-to-operate testing instruments combine high performance with convenient automation and user-interface features.



Particle Size Distribution

SALD-Series Particle Size Analyzers

From dense to superfine particles, Shimadzu offers a range of high-performance instruments to determine particle size distribution in the nanometer to millimeter range.



Testing the Tensile Strength, Modulus of Elasticity, and Bending Strength of Materials

Autograph Series

In order to ensure quality plastic products, Shimadzu offers a large selection of physical testing equipment, including our Autograph line of universal testers, which can perform various testing functions including bending, tensile, cyclic, high-speed, and high-accuracy modulus measurements.



Precise Weight Determination

Balances and Scales

Shimadzu Balances and Scales offer features found only on the finest weighing systems. A variety of weighing protocols including piece counting, autoprnt, specific density measurement, and choice of display units are available along with a selection of accessory devices to support expanded applications and productivity. The new MOC120H moisture balance uses an infrared quartz heater which is optimal for most samples.



Type of Evaluation	Properties	Shimadzu Products
Evaluation of Rheology Properties	Viscosity properties	Capillary Rheometer Flow Tester CFT-500D
	Viscosity curves	Automatic Mooney Viscometer SMV-300/300RT
Evaluation of Thermal Properties	Heat absorption and generation, reaction speed	Thermal Analysis DSC-60/DTG-60
	Specific heat capacity	Thermal Analyzer DSC-60
	Evaporation and decomposition, gas absorption, moisture content, heat resistance	Thermal Analyzer DTG-60 TGA-50
	Coefficient of thermal expansion/contraction, softening point	Thermal Analyzer TMA-60
Evaluation of Additives & Harmful Materials	Identification of additives	Gas Chromatograph-Mass Spectrometer GCMS-QP2010 Pyrolysis Measurement System
	Quantitative determination of additives	High-Performance Liquid Chromatograph Prominence Series
	Residual solvents	Gas Chromatograph-Mass Spectrometer GCMS-QP2010 Headspace Analysis System
	Heavy metals, trace elements	Atomic Absorption/Flame Emission Spectrophotometer Inductively Coupled Plasma Emission Spectrometer ICPE-9000
	Elemental analysis	Energy Dispersive X-ray Fluorescence Spectrometer EDX-720, 800, 900 Series, EDX-GP, μ EDX Series X-ray Fluorescence Spectrometer XRF-1800
Material Evaluation, Quality Control, Research & Development	Material evaluation	FTIR Spectrophotometer IRPrestige-21, IRAffinity-1
	Degree of crystallization	X-ray Diffractometer XRD-6000, XRD-7000
	Colorimetry	UV-VIS Spectrophotometer UV-1800, UV-2450, UV-2550
	Molecular weight distribution	High-Performance Liquid Chromatograph Prominence GPC System MALDI Time-of-Flight Mass Spectrometer
Evaluation of Physical Properties	Particle size distribution	Laser Diffraction Particle Size Analyzer SALD Series
	Density	Electronic Balance with Specific Gravity Kit (SMK)
Mass Evaluation	Mass, piece counting	Electronic Balances and Scales
	Moisture	Moisture Analyzer MOC120H
Mechanical Property Evaluation	Tensile properties	High-Precision Universal Testing Machine Autograph AG Series
	Compression properties	High-Precision Universal Testing Machine Autograph AG Series
	Bending properties	High-Precision Universal Testing Machine
	Hardness	Hardness Tester, Micro Hardness Tester
	Fatigue test	Fatigue Testing Machine Servopulser Magnetic Fatigue Testing Machine Microservo



Founded in 1875, Shimadzu Corporation, a leader in the development of advanced technologies, has a distinguished history of innovation built on the foundation of contributing to society through science and technology. We maintain a global network of sales, service, technical support and applications centers on six continents, and have established long-term relationships with a host of highly trained distributors located in over 100 countries. For information about Shimadzu, and to contact your local office, please visit our Web site at www.shimadzu.com.

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