

Schedule of Accreditation

issued by

United Kingdom Accreditation Service

21 - 47 High Street, Feltham, Middlesex, TW13 4UN, UK

 <p>0967</p> <p>Accredited to ISO/IEC 17025:2005</p>	ITS Testing Services (UK) Limited (Intertek MSG Laboratory)	
	Issue No: 020 Issue date: 08 April 2010	
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Testing performed at the above address only		

DETAIL OF ACCREDITATION

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used
<p>INORGANIC & ORGANIC CHEMICALS, POLYMERS, COMPOSITES AND PROCESS RELATED MATERIALS</p> <p>Materials for X-Ray Diffraction may typically include:</p> <p>Solid materials that can be formed or sampled as specimens, including:</p> <p>Polymers Composites Inorganic and Organic Chemicals Catalysts Environmental and Process Materials and Contaminants Formulations Foodstuffs Adhesives Pharmaceuticals Electronic Materials</p> <p>Liquids can also be examined, including:</p> <p>Suspensions Colloids Surfactants</p>	<p><u>Physical & Chemical Tests by X-Ray Diffraction</u></p> <p>X-Ray Diffraction patterns in reflection or transmission geometry</p> <p>Phase identification from X-ray diffraction patterns using ICDD Powder Diffraction File database</p> <p>Polymer Crystallinity Index</p>	<p>Documented In-House Methods</p> <p>X-ray diffraction (XRD) based on</p> <p>BS EN 13925-1:2003 BS EN 13925-2:2003 BS EN 13925-3:2005</p>



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<p>INORGANIC & ORGANIC CHEMICALS, POLYMERS, COMPOSITES AND PROCESS RELATED MATERIALS (cont'd)</p> <p>Materials for Inorganic Analysis may typically include:</p> <ul style="list-style-type: none"> Adhesives Catalysts Coatings Deposits Extracts Feedstocks Fibres Filled Materials Films Filters Food Contact Materials Foodstuffs Formulations Lubricants Metals Natural & Synthetic Polymers Oils Process Liquors Oxides Packaging Petrochemicals Pharmaceuticals Powders Processing Additives Raw Materials Residues Stabilisers Surfactants Supports Waste Streams 	<p><u>Chemical Tests by Inorganic Analysis</u></p> <p>Semi-Quantitative and Quantitative Elemental Analysis including:</p> <p>Catalyst Residues, Markers, Processing Additives, Stabilisers, Lubricants, Fillers, Poisons, Contamination, Trace Elements, Heavy metals, Corrosion</p> <p>CHN Analysis</p> <p>Carbon and Sulphur</p> <p>Trace Sulphur, Chlorine</p> <p>Trace Nitrogen</p> <p>Mercury Arsenic</p> <p>Loss on Ignition</p> <p>Halides, Sulphate & other Ions</p>	<p>In-House Methods using documented guidelines for single laboratory validation of methods of analysis using the techniques:</p> <p>Wavelength Dispersive X-Ray Fluorescence</p> <p>Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES)</p> <p>Inductively Coupled Plasma Mass Spectroscopy (ICP-MS)</p> <p>Oxidative Combustion with Infra-Red/Thermal Conductivity Detection</p> <p>Oxidative Combustion with Infra-Red Detection</p> <p>Microcoulometry</p> <p>Chemiluminescence</p> <p>Pyrolysis with Atomic Absorption Spectrometry</p> <p>Cold Vapour Atomic Fluorescence Spectrometry</p> <p>Inductively Coupled Plasma Mass Spectroscopy</p> <p>Inductively Coupled Plasma Optical Emission Spectroscopy</p> <p>Hydride Generation Flame Atomic Fluorescence Spectrometry</p> <p>Gravimetric Analysis</p> <p>Ion Chromatography</p>



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<p>INORGANIC & ORGANIC CHEMICALS, POLYMERS, COMPOSITES AND PROCESS RELATED MATERIALS (cont'd)</p> <p>Materials for Mechanical Testing may typically include:</p> <p>Adhesives Polymers Resins Composites/Filled Materials Films Polymer Granules Wood Packaging</p>	<p><u>Mechanical Tests</u></p> <p>Static, oscillating and ramp measurement of strength, stiffness and toughness in tensile, compressive and flexural mode ranges. Sub-ambient to elevated temperatures, loads to 100 kN.</p> <p>Long Term Tests:</p> <p>Tensile Creep Testing 23°C to + 250°C</p> <p>Creep Rupture (Static Fatigue) 23°C to +250°C</p> <p>Environmental Creep Rupture (Static Fatigue) at 23°C</p> <p>Dynamic Fatigue in Tension -70°C to +250°C</p> <p>Impact - Charpy (Energy 1 to 22J) (Temperature range -70°C to +80°C)</p> <p>Impact - Izod (Energy 1 to 22J) (Temperature range -70°C to +80°C)</p> <p>Hardness - Rockwell (Scales L,M,R)</p> <p>Heat Distortion Temperature (HDT)</p>	<p>Documented In-House Methods</p> <p>Universal testing machines</p> <p>Creep Testing Equipment</p> <p>Creep Rupture Equipment</p> <p>Environmental Creep Rupture Equipment</p> <p>Pneumatic Fatigue Sites and Universal Testing Machines</p> <p>ISO 179:2001 ASTM D6110-06</p> <p>ISO 180:2001 ASTM D256-06a</p> <p>BS EN ISO 2039-2 ASTM D785-03</p> <p>ISO 75:2004</p>



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<p>INORGANIC & ORGANIC CHEMICALS, POLYMERS, COMPOSITES AND PROCESS RELATED MATERIALS (cont'd)</p> <p>Materials for Mechanical Testing may typically include: (cont'd)</p> <p>Adhesives Polymers Resins Composites/Filled Materials Films Polymer Granules Wood Packaging</p>	<p><u>Mechanical Tests</u></p> <p>Tensile (Loads: 0.05N to 100 kN) (Temperature range -70°C to +350°C) (Strain to 1000%)</p> <p>Flexure (Loads: 0.05N to 100 kN) (Temperature range -70°C to +350°C)</p> <p>Density Compression (Loads: 0.05N to 100 kN) (Temperature range -70°C to +350°C)</p>	<p>Documented In-House Methods</p> <p>BS EN ISO 527-1:1993 BS EN ISO 527-2:1993 BS EN ISO 527-3:1996 BS EN ISO 527-4:1997 BS EN ISO 527-5:1997 BS 2782:Part 3: Methods 320C to 320F ASTM D638-03</p> <p>BS EN ISO 178:2001 BS 2782: Part 3: Method 335A ASTM D790-03</p> <p>In-house method BS EN ISO 604:2003 ASTM D695-02a</p>



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<p>ORGANIC CHEMICALS, POLYMERS, COMPOSITES , MONOMERS, SURFACTANTS, FORMULATIONS AND PROCESS RELATED MATERIALS</p> <p>Materials for NMR may typically include:</p> <p>Adhesives Cast Polymers Cured andUncured Resins Films Polymer Shrink Packaging Heat seal Polymers PET Hot melt polymers Oil field chemicals Acrylics Polypropylene Polyethylene Polyamides Polyurethanes Polyesters Surfactants Lubricants Epoxides EO/PO copolymers Ethoxylates Propoxylates</p>	<p><u>Chemical Tests by Nuclear Magnetic Resonance</u></p> <p>Quantitative and Qualitative NMR to determine/identify:</p> <p>Impurities</p> <p>Composition both Molar and weight/weight</p> <p>Chemical Identification</p> <p>End Group Analysis</p> <p>Polymer Sequencing</p> <p>Tacticity</p> <p>Distribution of isomers</p> <p>Distribution of isomers</p> <p>Average Mn</p> <p>Deformulation</p> <p>Additive Analysis</p> <p>Chemical Identification</p> <p>Distribution of isomers</p> <p>Kinetic studies</p>	<p>Documented In-House Methods</p> <p>Nuclear Magnetic Resonance GPC/NMR, ¹H, ¹³C, DEPT 135. 45 and 90, 2D NMR typically, COSY, HMBC, HMQC HETCOR, TOCSY, Multinuclear typically ³¹P, ¹⁹F, ¹¹B, ²⁷Al, ²⁹Si</p> <p>Using Spectrometers:</p> <p>JEOL Lambda 300 JEOL GSX 400 JEOL Eclipse 500</p>



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<p>INORGANIC & ORGANIC CHEMICALS, POLYMERS, COMPOSITES AND PROCESS RELATED MATERIALS</p> <p>Materials for Microscopy may typically include:</p> <ul style="list-style-type: none"> Additives Adhesives Catalysts Ceramics Coatings Colloids Composites Contamination Corrosion Products Deposits Dyes Electronics Environmental Epoxy Fibres Fillers Films Filters Foods Greases Hydrocarbons Impurities Inorganics Lacquers Laminates Liquids Lubricants Machine Parts Medical Devices Metals Monomers Nano Materials Oils Organics Paints Pharmaceuticals Pigments Plastics Polymers Powders 	<p><u>Physical Tests by Microscopy</u></p> <p>Light Microscopy imaging of materials at various magnification</p> <p>SEM imaging of materials at various magnification</p> <p>TEM imaging of materials at various magnification</p> <p>Elemental identification and Qualitative Analysis</p>	<p>Documented In-House Methods</p> <p>Stereo Light Microscopy</p> <p>Transmission Light Microscopy</p> <p>All techniques available ie transmission, reflected, brightfield, darkfield phase, DIC, fluorescent, UV, etc</p> <p>SEM - SECONDARY</p> <p>SEM - BACKSCATTER</p> <p>SEM - CRYO</p> <p>TEM - BRIGHTFIELD</p> <p>TEM - DARKFIELD</p> <p>STEM</p> <p>SEM - EDX</p> <p>TEM - EDX</p>



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<p>INORGANIC & ORGANIC CHEMICALS, POLYMERS, COMPOSITES AND PROCESS RELATED MATERIALS (cont'd)</p> <p>Materials for Surface Analysis may typically include:</p> <p>Adhesives Biomaterials Cast Polymers Catalysts Ceramics Coated Materials Composites Cured and Uncured Resins Extruded Materials Fibres Filled Materials Films Foodstuffs Glass Laminated Materials Lubricants Medical Devices Metals Natural Products Packaging Materials Pharmaceutical Ingredients Plastics Polymers Polymer Additives Polymer Granules Powders Printed Materials Rubbers Semiconductors Surface Engineered Materials Surfactants</p>	<p><u>Chemical and Physical Tests by Surface Analysis</u></p> <p>Qualitative and Quantitative Analysis by XPS enabling measurement of:</p> <p>Identification of elements and chemistry present in the surface region</p> <p>Quantification of elements and chemistry present in the surface region</p> <p>Identification and Quantification of functional groups and oxidation states</p> <p>Adhesion 'Plane of Failure' analysis</p> <p>Mapping of surface elemental and chemical distribution</p> <p>Work Function</p> <p>Coating thickness</p> <p>Qualitative and Quantitative Analysis enabling measurement of:</p> <p>Identification of elements and molecular species present in the surface region</p> <p>Relative Quantification of molecular species present in the surface region</p> <p>Identification of functional groups</p> <p>Adhesion 'Plane of Failure' analysis</p>	<p>Documented In-House Methods</p> <p>X-Ray Photoelectron Spectroscopy (XPS)</p> <p>Electron Spectroscopy for Chemical Analysis (ESCA)</p> <p>XPS and Imaging XPS using the Kratos 'Axis Ultra' X-ray Photoelectron Spectrometer</p> <p>SOP/SA/27 ESCA calibration procedure for the Kratos 'Axis Ultra'</p> <p>SOP/SA/28 ESCA experimental procedure for the Kratos 'Axis Ultra'</p> <p>SAM/SA/1 The determination of surface elemental composition by ESCA</p> <p>Static Secondary Ion Mass Spectrometry (SSIMS), Imaging SSIMS, SIMS Depth Profiling (DSIMS) using the IonToF 'ToFSIMS IV' spectrometer</p> <p>SOP/SA/29 SIMS calibration procedure for the IonToF 'ToFSIMS IV'</p> <p>SOP/SA/30 SIMS experimental procedure for the IonToF 'ToFSIMS IV'</p>



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<p>INORGANIC & ORGANIC CHEMICALS, POLYMERS, COMPOSITES AND PROCESS RELATED MATERIALS (cont'd)</p> <p>Materials for Surface Analysis may typically include: (cont'd)</p> <ul style="list-style-type: none"> Adhesives Biomaterials Cast Polymers Catalysts Ceramics Coated Materials Composites Cured and Uncured Resins Extruded Materials Fibres Filled Materials Films Foodstuffs Glass Laminated Materials Lubricants Medical Devices Metals Natural Products Packaging Materials Pharmaceutical Ingredients Plastics Polymers Polymer Additives Polymer Granules Powders Printed Materials Rubbers Semiconductors Surface Engineered Materials Surfactants 	<p><u>Chemical and Physical Tests by Surface Analysis</u></p> <p>Qualitative and Quantitative Analysis by XPS enabling measurement of:</p> <p>Mapping of surface elemental, chemical and molecular distributions</p> <p>Coating thickness and continuity</p> <p>Composition depth profiles</p>	<p>Documented In-House Methods</p> <p>X-Ray Photoelectron Spectroscopy (XPS)</p> <p>SAM/SA/3 Relative Quantification for Static SIMS - Experimental Method for the IonToF 'ToFSIMS IV'</p>



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<p>INORGANIC & ORGANIC CHEMICALS, POLYMERS, COMPOSITES AND PROCESS RELATED MATERIALS (cont'd)</p> <p>Materials for Thermal Analysis may typically include:</p> <ul style="list-style-type: none"> Adhesives Cast Polymers Ceramics Composites Cured and Uncured Resins Extruded Materials Filled Materials Films Foodstuffs Metals Plastics Polymer Granules Powders Rubbers Shrink Packaging Surfactants 	<p><u>Physical Tests by Thermal Analysis</u></p> <p>Quantitative analysis by DSC, enabling measurement of:</p> <ul style="list-style-type: none"> Crystallisation temperatures Degree of Crystallinity Enthalpy of fusion (Delta H) Enthalpy of re-crystallisation (Delta H) Glass transition temperatures (Tg) Melting points Phase transition temperatures Specific heat capacity (Cp) <p>Quantitative analysis by TMA, enabling measurement of:</p> <ul style="list-style-type: none"> Coefficient of linear thermal expansion (CLTE) Dimensional change with temperature or force variation Material anisotropy Softening point (penetration and indentation studies) 	<p>Documented In-House Methods</p> <p>Differential Scanning Calorimetry (DSC)</p> <p>Thermomechanical Analysis (TMA)</p>



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<p>INORGANIC & ORGANIC CHEMICALS, POLYMERS, COMPOSITES AND PROCESS RELATED MATERIALS (cont'd)</p> <p>Materials for Vibrational Spectroscopy may typically include:</p> <p>Solids, liquids or gases</p> <p>Additives Adhesives Catalyst materials Coatings Composite materials Experimental products Formulations Inorganic pigments/powders /additives Manufactured polymer articles Medical devices Pharmaceuticals Plastics Process or Production contaminants Process related chemicals</p>	<p><u>Tests by Vibrational Spectroscopy</u></p> <p>Measurement of mid-Infrared, Near-Infrared, far-Infrared spectra, Raman, & UV/Vis spectra</p> <p>Coat weight measurement</p> <p>Crystallinity and orientation in polymers</p> <p>Quantitative analysis of comonomers for polymer composition</p> <p>Identification of unknown materials</p> <p>Identification of product/process contaminants or by-products</p> <p>Product deformation</p> <p>Competitive materials analysis</p> <p>Structural elucidation of complex articles e.g. multilayer films, laminates, packaging materials, composites</p> <p>Analysis of surface composition and/or surface contamination</p> <p>Measurement of optical properties of materials (UV/vis transmittance/ reflectance/absorption)</p> <p>Chemical imaging</p> <p>Reaction kinetics/mechanistic investigations, including Homogeneous Catalysis</p> <p>Analysis of surfaces of powders (inorganic, organic and metallic)</p>	<p>Documented In-House Methods:</p> <p>Transmission and reflection FTIR spectroscopy</p> <p>FTIR microscopy (transmission, specular reflectance and μATR)</p> <p>DRIFTS (Diffuse reflectance infrared spectroscopy)</p> <p>Photoacoustic FTIR spectroscopy</p> <p>FTIR global imaging</p> <p>Raman spectroscopy Confocal Raman microscopy</p> <p>Attenuated total reflectance (ATR) FTIR spectroscopy (macro and micro)</p> <p>Chemical imaging by Raman/FTIR mapping</p> <p>UV/vis transmission</p> <p>UV/vis reflectance (diffuse reflectance using integrating sphere)</p> <p>Hot stage microscopy (FTIR and Raman)</p> <p>Time-resolved spectroscopy</p> <p>Process monitoring (by Raman spectroscopy)</p> <p>Surface Enhanced Raman Spectroscopy (SERS)</p>



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<p>INORGANIC & ORGANIC CHEMICALS, POLYMERS, COMPOSITES AND PROCESS RELATED MATERIALS (cont'd)</p> <p>Materials for Separation Science may typically include: (cont'd)</p> <p>Air Chemicals Chemical Formulations Gases Polymers Polymer Articles Water Waste Waters (cont'd)</p>	<p><u>Chemical Tests by Separation Science</u></p> <p>Refinery Gas Analysis (RGA):</p> <p>Chemical composition (%v/v) Hydrogen 0.2 to 25 Nitrogen 0.02 to 1 Carbon dioxide 0.02 to 2 Methane 20 to 100 Ethane 0.02 to 3 Ethene 0.02 to 3 Propane 0.02 to 1 Propene 0.02 to 1 C₄'s 0.02 to 1 C₅'s 0.02 to 1 C₆'s 0.02 to 1</p> <p>Quantitative Analysis of vapours</p>	<p>Documented In-House Methods:</p> <p>Documented in house methods MSG-LAB-SAM-GC-274 and MSG-LAB-SAM-GC-275</p> <p>Detector Tubes, Absorption and Thermal and Solvent Desorption/Extraction followed by Gas Chromatography HPLC Ion Chromatography Gas Chromatography - Mass Spectrometry, based on: MDHS Methods NIOSH Methods OSHA Methods</p>



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<p>AQUEOUS SOLUTIONS, ORGANO-METALLIC COMPLEXES, ORGANIC CHEMICALS, POLYMERS, COMPOSITES, MONOMERS, SURFACTANTS, FORMULATIONS AND PROCESS RELATED MATERIALS</p> <p>Materials for Mass Spectrometry may typically include:</p> <p>Adhesives Cast Polymers Cured and Uncured Resins Ethylene Vinyl Acetates Films Polymer Shrink Packaging Heat seal Polymers PET Hot melt polymers Oil field chemicals Acrylics Polypropylene Polybutadiene Polyethylene Polyamides Polyurethanes Polyesters Surfactants Lubricants Epoxides EO/PO copolymers Ethoxylates Propoxylates Vinyl Alcohol Vinyl Acetate</p>	<p><u>Chemical Tests by Mass Spectrometry</u></p> <p>Polymer end groups differentiation between cyclic and linear oligomers</p> <p>Average Mn Polydispersity</p> <p>Deformulation</p> <p>Chemical Identification of semi-volatile species</p> <p>Characterisation of cross-linked or insoluble polymers</p> <p>Characterisation of low level volatiles, undesirable impurities, identification of oligomeric species</p> <p>Quantification Additive/impurities/waste streams</p> <p>Evolved volatiles and thermal degradation characterisation of volatile components</p> <p>Characterisation of non-soluble polymers</p> <p>Identification and quantification of migratory species</p>	<p>Documented In-House Methods:</p> <p>Prerequisite Standard Operating Procedures (SOPS) Standard Analytical Methods (SAMS)</p> <p>Mass spectrometry using EI/CI/FD/FI/ESI/APCI Ionisation, liquid secondary ion MS</p> <p>Gas Chromatography - Mass Spectrometry (GC/MS)</p> <p>Liquid Chromatography - Mass Spectrometry LC-MS/MS</p> <p>Pyrolysis - Mass Spectrometry</p> <p>Matrix assisted laser desorption Ionisation time of flight mass spectrometry MALDI-TOF</p> <p>Tandem mass spectrometry (MS/MS)</p> <p>Gel-permeation Chromatography-mass spectrometry (GPC-MS)</p> <p>Thermal desorption (TD) GC-MS Head space GC-MS</p> <p>Gas chromatography-mass spectrometry (GC-MS)Pyrolysis GC-MS</p>



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<p>INORGANIC & ORGANIC CHEMICALS, POLYMERS, COMPOSITES AND PROCESS RELATED MATERIALS (cont'd)</p> <p>Materials for Chemical Analysis may typically include: (cont'd)</p> <p>Materials and articles in contact with foodstuffs - plastic: (cont'd)</p> <p>Acrylics (PMMA) Cellophane Cellulose Closures/sealing gaskets for polymers Components of paper and cardboard Ethylene vinyl acetate (EVA) Liquids Nylon Polymers Olefin Polymers Organic Compounds PEK Polymers Perfluorocarbons (PTFE) Plastic Polymers Polyamide (PA) Polyetheretherketone (PEEK) Polyethylene (PE) Polyethylene phthalate (PET) Polypropylene (PP) Polystyrene (PS) Polysulphone (PES) Polyvinylchloride (PVC) Ploymeric coatings on metal substrates, glass cloth, paper and paperboard Solids Textiles</p>	<p><u>Chemical Tests by Chemical Analysis</u></p> <p>European Overall and Specific Migration guide laying down the basic rules Directives, 82/711/EEC 85/572/EEC and 94/62/EC</p>	<p>Documented In-House Methods:</p> <p>European EN 1186-10:2002 Overall migration into olive oil (modified method where incomplete extraction of olive oil occurs)</p> <p>European EN 1186-12:2002 Overall migration at low temperatures</p> <p>European EN 1186-13:2002 Overall migration at high temperatures</p> <p>European EN 1186-14:2002 "Substitute tests" for overall migration intended to come into contact with fatty foodstuffs using test media iso-octane and 95% ethanol</p> <p>European EN 1186-15:2002 Alternative test methods to migration in fatty food simulants by rapid extraction into iso-octane and 95% ethanol</p> <p>European EN 13130-2:2004 Determination of Terephthalic Acid in food simulants</p>



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United Kingdom Accreditation Service
21 - 47 High Street, Feltham, Middlesex, TW13 4UN, UK

ITS Testing Services (UK) Limited
(Intertek MSG Laboratory)

Issue No: 020 Issue date: 08 April 2010

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Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used
<p>INORGANIC & ORGANIC CHEMICALS, POLYMERS, COMPOSITES AND PROCESS RELATED MATERIALS (cont'd)</p> <p>Materials for Chemical Analysis may typically include: (cont'd)</p> <p>Materials and articles in contact with foodstuffs - plastic: (cont'd)</p> <p>Acrylics (PMMA) Cellophane Cellulose Closures/sealing gaskets for polymers Components of paper and cardboard Ethylene vinyl acetate (EVA) Liquids Nylon Polymers Olefin Polymers Organic Compounds PEK Polymers Perfluorocarbons (PTFE) Plastic Polymers Polyamide (PA) Polyetheretherketone (PEEK) Polyethylene (PE) Polyethylene phthalate (PET) Polypropylene (PP) Polystyrene (PS) Polysulphone (PES) Polyvinylchloride (PVC) Ploymeric coatings on metal substrates, glass cloth, paper and paperboard Solids Textiles</p>	<p><u>Chemical Tests by Chemical Analysis</u></p> <p>Total extractives in solvents including chloroform extractable, xylene soluble, hexane soluble, fluoride and heavy metals for polymers, resins, paper and paperboard and adhesives as specified in the FDA Code of Federal Regulations parts 21 CFR 175, 21 CFR 176 and 21 CFR 177</p> <p>Overall migration and specific migration testing according to the FDA guidelines in support of FDA notification for a new food contact substance indirect or direct food contact</p>	<p>Documented In-House Methods:</p>



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Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used
<p>INORGANIC & ORGANIC CHEMICALS, POLYMERS AND AQUEOUS SUSPENSIONS, SURFACTANTS, TEXTILES</p> <p>Materials for Chemical Analysis may typically include:</p> <p>Surfactants Polymers Polymer Aqueous Suspensions</p>	<p><u>Chemical Tests</u></p> <p>The determination of:</p> <p>Ammonium perfluoro octanoate (APFO)</p>	<p>Documented In-House Methods:</p> <p>SAM/CHEM/PAF9</p>
	END	