



Polymer analysis by NIR and Raman spectroscopy

Materials, parameters, and
methods to analyze them

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Polymer manufacturers rely on precise analysis of their materials to ensure compliance, optimize production processes, and meet customer specifications. Real-time knowledge of polymer composition is crucial to reach these goals. Spectroscopic techniques, particularly near-infrared (NIR) and Raman spectroscopy, offer fast, accurate,

non-destructive, and versatile testing solutions. These methods enable the characterization, identification, and quantification of various polymers, facilitating both quality control and research. Metrohm provides you with top-quality analytical instruments, expertise, and first-class, on-site service to enable and support your polymer production and/or polymer processing.

This flyer gives you an overview of several key quality parameters that can be analyzed by which technology using Metrohm instrumentation. You can find more detailed information within the corresponding linked Metrohm application documents, or by downloading our comprehensive eBook [EB-004](#).

Sample	Parameter of interest	Analysis technique	Metrohm Application Documents
Polyamide (PA)	Relative viscosity	NIR spectroscopy, Process analysis	AN-NIR-060
	Carboxylic end groups	NIR spectroscopy, Process analysis	AN-NIR-060
	Amine end groups	NIR spectroscopy, Process analysis	AN-NIR-060
	Reaction monitoring of polymerization	Raman spectroscopy, Process analysis	
	Raw material identification (RMID)	Raman spectroscopy	
	Identification, differentiation	Raman spectroscopy	AN-RS-001
(Recycled) Polyethylene terephthalate (PET and rPET)	Intrinsic viscosity	NIR spectroscopy	AN-NIR-023 , AN-NIR-112
	Acid number	NIR spectroscopy	AN-NIR-023
	Isophthalic acid content	NIR spectroscopy	AN-NIR-023
	Diethylene glycol content	NIR spectroscopy	AN-NIR-023
	Identification, differentiation	Raman spectroscopy	AN-RS-001
	Raw material identification (RMID)	Raman spectroscopy	AN-RS-008
	Moisture content	NIR spectroscopy, Process analysis	
	Melt flow index	NIR spectroscopy, Process analysis	AN-NIR-082
	Melt density	NIR spectroscopy, Process analysis	
Polyethylene (PE)	Density	NIR spectroscopy	AN-NIR-102
	Ash content	NIR spectroscopy	AN-NIR-102
	Identification (HDPE, LDPE, PP)	NIR spectroscopy	AN-NIR-083
	Identification, differentiation	Raman spectroscopy	AN-RS-001
	Identification of masterbatches	Raman spectroscopy	AN-RS-007
Polypropylene (PP)	PE content	NIR spectroscopy	AN-NIR-124
	Melt flow rate (MFR)	NIR spectroscopy	AN-NIR-082
	Identification (HDPE, LDPE, PP)	NIR spectroscopy	AN-NIR-083
	Identification, differentiation	Raman spectroscopy	AN-RS-001 , 410000051
	Raw material identification (RMID)	Raman spectroscopy	AN-RS-008
	Identification of masterbatches	Raman spectroscopy	AN-RS-007

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Sample	Parameter of interest	Analysis technique	Metrohm Application Documents
Polyvinyl chloride (PVC)	Molecular weight	NIR spectroscopy	AN-NIR-098
	PVDC coating thickness	NIR spectroscopy	AN-NIR-092
	Identification, differentiation	Raman spectroscopy	AN-RS-001
	Acetylene content	NIR spectroscopy, Process analysis	
	Ethylene dichloride (EDC) content	NIR spectroscopy, Process analysis	
	Vinyl chloride monomer (VCM) content	NIR spectroscopy, Process anlaysis	
Polyurethane (PU)	Hydroxyl content of polyols (OH value)	NIR spectroscopy	AN-NIR-035
	Isocyanate content	NIR spectroscopy, Process analysis	AN-NIR-068 , AN-PAN-1041
Ethylene tetrafluoroethylene (ETFE)	Melt flow rate (MFR)	NIR spectroscopy	AN-NIR-119
	Moisture content	NIR spectroscopy	AN-NIR-119
Polystyrene (PS)	Functionalization for water solubility	Raman spectroscopy	410000053
	Identification, differentiation	Raman spectroscopy	AN-RS-001
	Raw material identification (RMID)	Raman spectroscopy	AN-RS-008 , AN-RS-034
Polyphenylene ether (PPE)	Raw material identification (RMID)	Raman spectroscopy	AN-RS-034
Polymethyl methacrylate (PMMA)	Acrylic acid purity	NIR spectroscopy, Process analysis	
Polyester	Polymerization monitoring of carboly group	Raman spectroscopy, Process analysis	

Analysis techniques



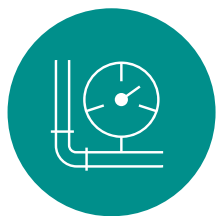
NIR SPECTROSCOPY – MULTI-PARAMETER ANALYSIS WITHIN MINUTES

Near-infrared (NIR) spectroscopy can be used to assess the quality of polymers and polymer raw materials. It is an ideal technique to quantify not only chemical but also rheological and physical parameters. Besides parameters such as hydroxyl value, isocyanate value, or moisture, NIRS can also determine intrinsic viscosity and melt-flow rate. Compared to the traditional methods, results can be obtained in a few seconds and without the need for additional reagents or chemicals.



RAMAN SPECTROSCOPY – FAST, SIMPLE, REAL-TIME MONITORING

With Raman, manufacturers can quickly check raw materials at the point of receipt before they enter production and avoid costs associated with long laboratory wait times, production interruptions, and training of technical personnel. Its high material specificity, large libraries of known substances and mixtures, and the ability to sample plastics in myriad forms including clear and colored composites, coatings, and adhesives provide both high accuracy and flexibility for the precise characterization of plastic materials and mixtures.



PROCESS ANALYSIS – DEPENDABLE ONLINE, INLINE, AND ATLINE SOLUTIONS

Process optimization through real-time monitoring of parameters such as moisture content, melt flow index, and polymerization rate saves time and substantially lowers production costs. Metrohm Process Analytics offers NIR and Raman measurements in different analyzer configurations for any need. The same high-quality Metrohm laboratory techniques can now be used right on the production floor for the most accurate results delivered directly to the process control room.