Polymer Analysis with MALDI-TOF

- Straightforward workflows for polymer characterization

Innovation with Integrity

MALDI-TOF MS

Simple, Straightforward, and Specific

Rapid Determination of Chemical Features of Polymers

Determination of:

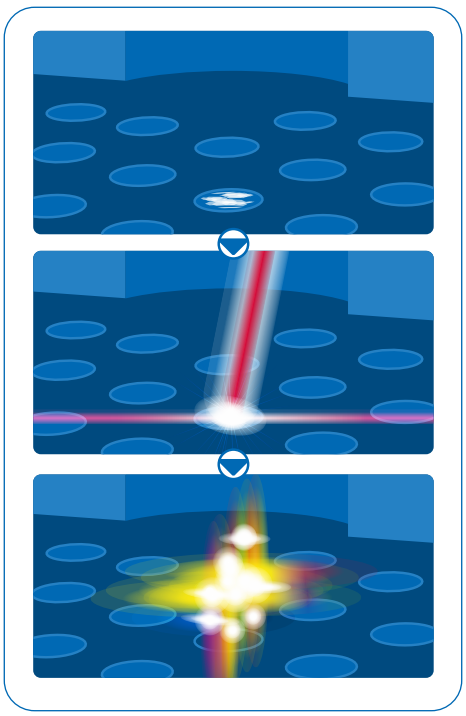
- *Sums of end groups*
- *Molecular weight distributions (Mn and Mw)*
- *Dispersity*
- *Single end group analysis*

Whether for bulk material screens, pharmaceutical development, or finished surface analyses, Bruker's MALDI-TOF MS systems can provide a comprehensive picture with speed and efficiency.

The MALDI-TOF Advantage

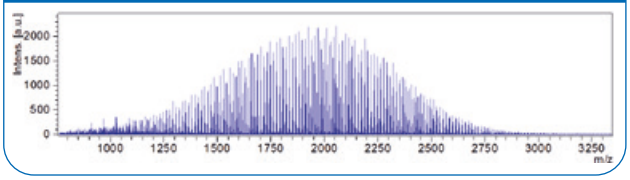
Matrix-Assisted Laser Desorption Ionization (MALDI) uses a laser for ionization of samples embedded in a matrix.

- Fast and sensitive
- Broad molecular weight range (up to ~ 600 kDa)
- Positive and negative ionization
- Smartbeam laser for highest ionization efficiency and life time
- Solution specific software for simplified data interpretation including industry leading Polymerix and PolyTools software



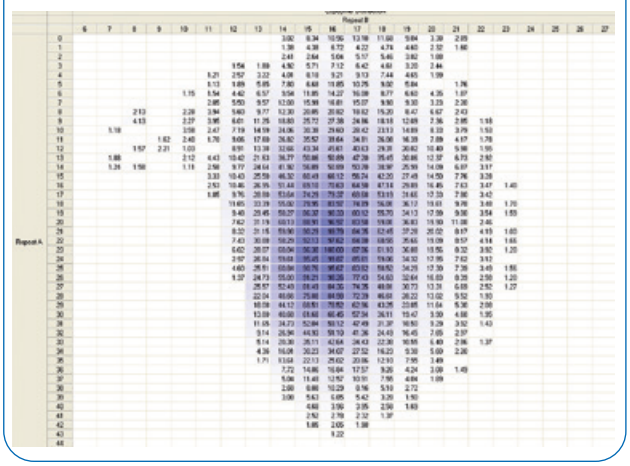
Quality Control Details - Ready for your Report

Average Molecular Weight 1900 Da

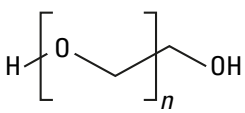


QC analysis of co-polymers using MALDI-TOF MS system. Co-polymer consisting of PEG and PPG: PEG-block-PPG-block-PEG.

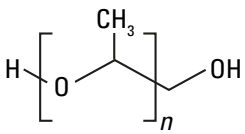
Polymerix software (Sierra Analytics)



Display of repeating units in Polymerix software.

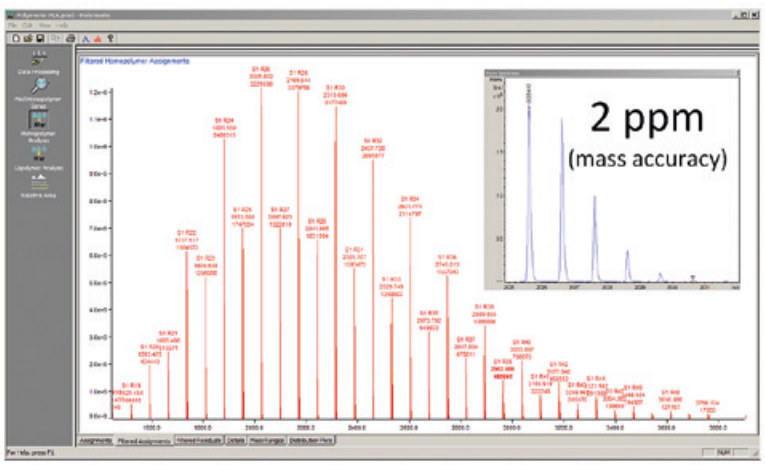


Vertical axis: Number of repeating units A (PEG)



Horizontal axis: Number of repeating units B (PPG)

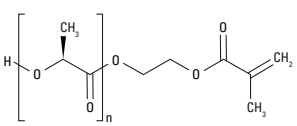
Polymerix software (Sierra Analytics)

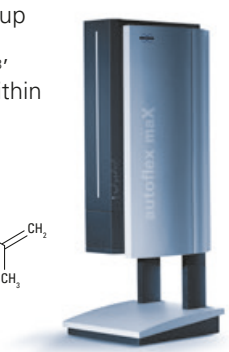


Series Label	Mn	Mw	Mz	PD	DPn	DPw	DPz	Percent Series	Percent Spectrum	Alpha End Group	Repeat
Total/Average	2301.420	2376.458	2455.888	1.033	30.149	31.191	32.294	100.00	99.92	C6H1003	C3H4O2
S1	2301.420	2376.458	2455.888	1.033	30.149	31.191	32.294	100.00	99.92	C6H1003	C3H4O2

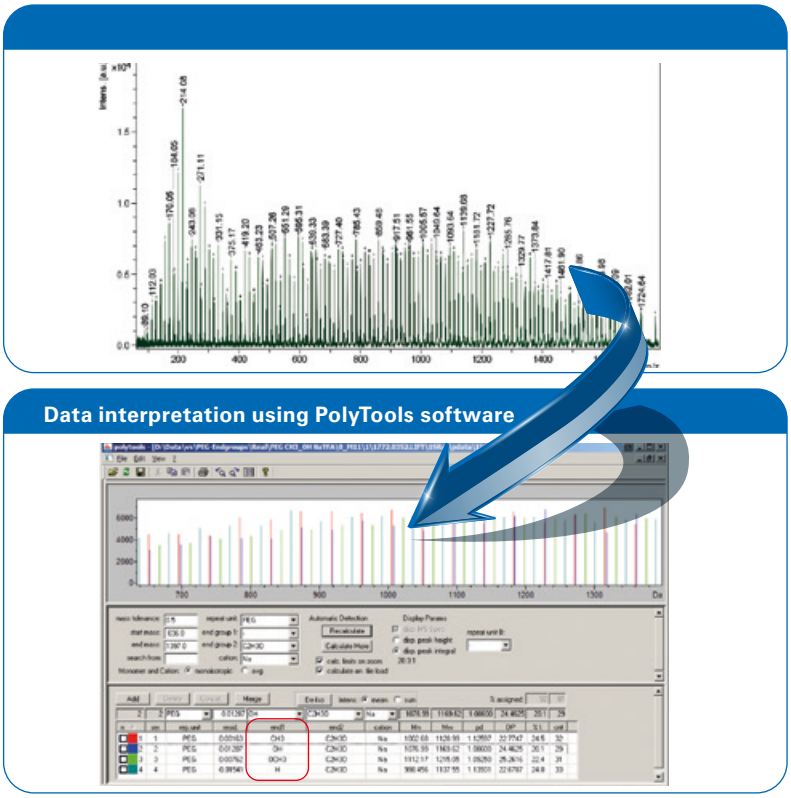
#	Combined End Group	DBE	Adduct	Loss	Computed Series m/z	| Error | mDa	Error mDa	Error ppm	Cluster Similarity
1	C6H1003	2.0	Na		2097.62271	4.358	4.358	2.077	0.994
2	C7H1402	1.0	Na		2097.65909	32.028	-32.028	-15.269	0.992
3	C2H202	2.0	Na		2097.58632	40.743	40.743	19.424	0.994

QC analysis of polylactic acid on an **autoflex maX** MS system. Monomer units are easily verified, and the overview spectrum (ext. calibration) indicates that polymerization occurred from both monomer and dimer species. The combined end group is identified as $C_6H_{10}O_3$, with mass accuracy within 2 ppm.

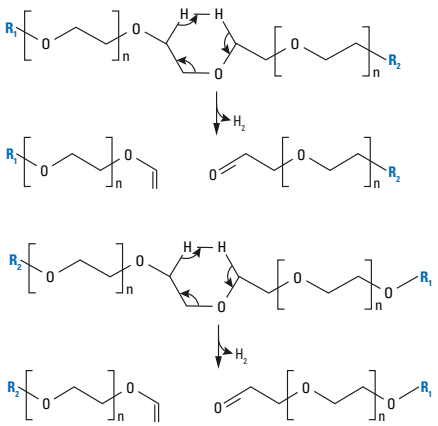




Side Reaction Investigations via MS/MS

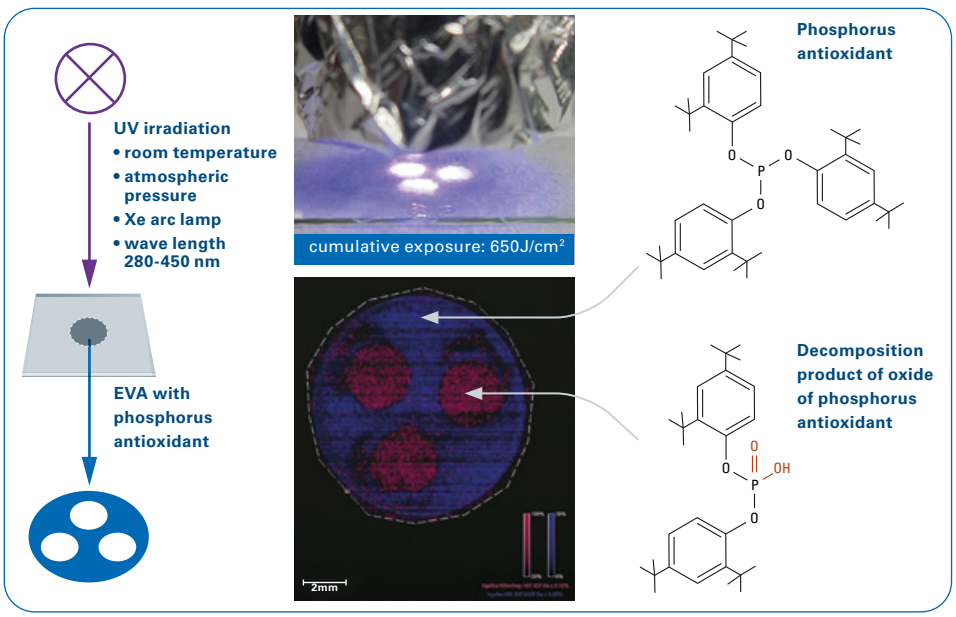


Side reactions are easily detected using PolyTools and MS/MS analysis of Poly(ethylene glycol) methyl ether (Precursor m/z = 1772.04 Da) on an autoflex MS system. PolyTools software (lower image) allows the interrogation of complex MALDI MS/MS data (upper left) enabling the rapid identification of different single end groups.



Adapted from Knop et al., Macromol. Chem. Phys. 2010, 211, 677–684

Direct Surface Analyses of Additives



MALDI-TOF Imaging of a treated EVA polymer surface on an ultrafleXtreme MS system following UV-light treatment provides clear molecular fingerprints indicating decomposition of a low molecular weight phosphorus antioxidant added to protect the polymer against degradation.

By courtesy of Nitto Analytical Techno-Center Co., Ltd., Japan

Ready results, with confidence and speed

Bruker's MALDI-TOF and TOF/TOF MS systems maximize data output for polymer analyses

MALDI-TOF technology offers a unique depth of characterization for many diverse polymer classes. Bruker's innovative MALDI-TOF and TOF/TOF systems deliver high quality data and are optimized for robust, worry free operation. All MALDI systems are engineered for speed with each analysis taking approximately 1 s for confident analyses across wide molecular weight and dynamic ranges. Further, related peptides, proteins, and small molecules can be readily detected on the same analytical platform, offering unmatched flexibility for your MS needs.

Along with intuitive software tools to streamline both data collection and analysis, results can be generated with unparalleled speed, simplicity and efficiency for a wide range of applications, including:

- Synthesis / Quality Control
- Side Reaction Analysis
- Co-polymer Analysis
- Surface Analysis /Imaging
- Additive Evaluation

Sierra ANALYTICS

Bruker's MALDI-TOF mass spectrometry systems have the answers you need.

For Further Reading:

Kudo T, Macht M, and Kuroda M (2011) Laser Desorption Ionization-Time-of-Flight Mass Analysis of Perfluoropolyether Monolayer Directly from Hard Disk Medium Surface, Analytical Chemistry, 83 (14), 5563–5569

Kudo T and Nirasawa, T (2011) Mass Spectrometry: Evaluation of Industrial Materials Using MALDI-TOF-MS, Journal of the Imaging Society of Japan, 50 (5), 448-454.

Application Note # MT-105, MALDI-CID Study of Poly (Methyl Methacrylate)

Poster Note #PN-35, A trail of TLC-Maldi for analysis of industrial materials

SCiLS Lab 2D: Quantitative Measure for Co-localization of m/z-images

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