

Measuring Purity of MEG (monoethylene glycol)

Applied Analytics Application Note No. AN-003

Image: Synthetic polyester fiber made from high-purity MEG.

Application Summary

Analyte: % Transmittance in Monoethylene glycol (MEG)

Detection Technology: OMA-300 Process Analyzer

Process Stream: MEG

Measurement Range: 80-100 %T

Introduction

Monoethylene glycol, abbreviated as MEG but also known simply as glycol, is used as a precursor to manufacture polyester fibers. As impurities in the quality of the MEG feedstock will impact the fiber's quality, monitoring the purity of MEG is crucial to ensuring it will meet the needs of polyester fiber manufacturers.

A common method for validating the quality of glycol involves measuring its transmittance at 220nm, 240nm, 275nm, and 350nm. A purer sample of MEG will have a higher transmittance at these wavelengths whereas low transmittance at these locations would indicate the presence of impurities.

The traditional method for measuring MEG quality (ASTM E2193) relies on samples being pulled for offline analysis. However, the challenge with this method is that glycol, when exposed to oxygen, forms complexes that create absorbance at 220 nm. While the ASTM calls for sparging the sample with nitrogen before making transmittance measurements, if plant staff either fail to sparge the sample sufficiently or forget to sparge the sample entirely, this interference can appear in the test. This can potentially cause the MEG to fail its quality test when it would otherwise pass.

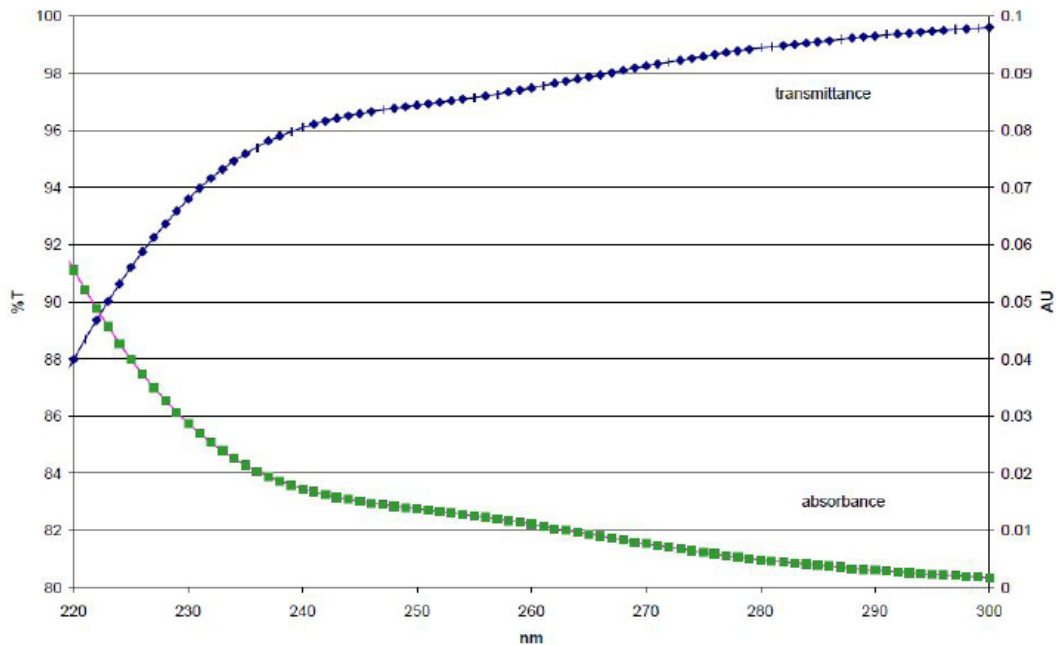
Online analysis eliminates both the potential for oxygen complex interference and human error by removing the need for manual sampling and analysis, entirely. The OMA-300 with its dispersive spectrometer is able to measure the absorbance of MEG at 220nm, 240nm, 275nm, and 350nm simultaneously and in real-time. With continuous analysis, updating every one to five seconds, the OMA-300 allows you to promptly identify and resolve issues as they occur.

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Transmittance Spectrum of Pure MEG

The spectra below visualize the transmittance spectrum of pure MEG, along with the corresponding absorbance values (AU) at each wavelength:



Required Accuracy Threshold

As demonstrated by the table below (see column A-A'), a photometric accuracy of ± 0.001 AU (at 220 nm) is required to maintain a measurement accuracy of $\pm 0.3\%$ Transmittance:

T%	A (AU)	T%+0.3 %	A'(AU)	A-A' (AU)
80.0000	0.0969	80.3000	0.0953	0.0016
81.0000	0.0915	81.3000	0.0899	0.0016
82.0000	0.0862	82.3000	0.0846	0.0016
83.0000	0.0809	83.3000	0.0794	0.0016
84.0000	0.0757	84.3000	0.0742	0.0015
85.0000	0.0706	85.3000	0.0691	0.0015
86.0000	0.0655	86.3000	0.0640	0.0015
87.0000	0.0605	87.3000	0.0590	0.0015
88.0000	0.0555	88.3000	0.0540	0.0015
89.0000	0.0506	89.3000	0.0491	0.0015
90.0000	0.0458	90.3000	0.0443	0.0014
91.0000	0.0410	91.3000	0.0395	0.0014

Wavelength Accuracy and Reproducibility

Transmittance measurement requires extremely stable wavelength accuracy. If the diode drifts wavelength assignment, significant measurement error is introduced. Mechanical scanning instruments with filters have moving parts that wear over time and lose wavelength assignment. The solid state OMA uses a photodiode array for extremely stable accuracy.

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Rich Trend Data

Since the OMA performs continuous analysis of MEG purity, trend data is available to the operator with easily configured data storage to view process history.



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The specifications below represent performance of the OMA-300 Process Analyzer in a typical MEG purity application.

For technical details about the OMA-300 Process Analyzer, see the data sheet:

http://aai.solutions/documents/AA_DS001A_OMA300.pdf

All performance specifications are subject to the assumption that the sample conditioning system and unit installation are approved by Applied Analytics. For any other arrangement, please inquire directly with Sales.

Subject to modifications. Specified product characteristics and technical data do not serve as guarantee declarations.

Application Data	
Performance Specifications	
Accuracy	MEG Transmittance at 220 nm @ 80-100 %T measurement range: ± 0.3 %T

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Further Reading

Subject	Location
OMA-300 Process Analyzer Data sheet	http://aai.solutions/documents/AA_DS001A_OMA300.pdf
Advantage of Collateral Data Technical Note	http://aai.solutions/documents/AA_TN-202_CollateralData.pdf



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