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

MEG is an important raw material in production of polyester fibers. The quality of the fibers is dependent on the purity level of the MEG precursor. MEG is therefore purified of impurities (e.g. diethylene glycol) by passing the stream through an ion exchange column. Over time, the column performance deteriorates and impurities begin breaking through.

Fiber grade MEG must comply with analytical purity tests in order to be salable. Additionally, the ion exchange columns should be replaced precisely at the point of efficiency dropoff in order to avoid both column waste and impure product.

The traditional offline method for MEG quality control relies on pulling samples for lab analysis. The lab system compares the sample's UV transmittance at a few wavelengths (220 nm, 240 nm, 275 nm, 350 nm) to that of demineralized water at the same wavelengths. Since pure MEG has zero absorbance in the UV range, a simple principle applies: higher transmittance = higher purity. Fiber-grade MEG is required to have at least 97% transmittance at 220 nm.

The OMA system applies the same principle, ASTM method ASTM E2193, but with enormous advantages, including: (1) continuous analysis updating every 1-5 seconds, as opposed to slow sample transport for discrete lab measurements; (2) fast response for immediately pinpointing failure point of ion exchange column; (3) totally automated sampling system normalizes measurement by Auto Zero on distilled water; (4) installation of system close to sampling point for convenience of process adjustment.

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:
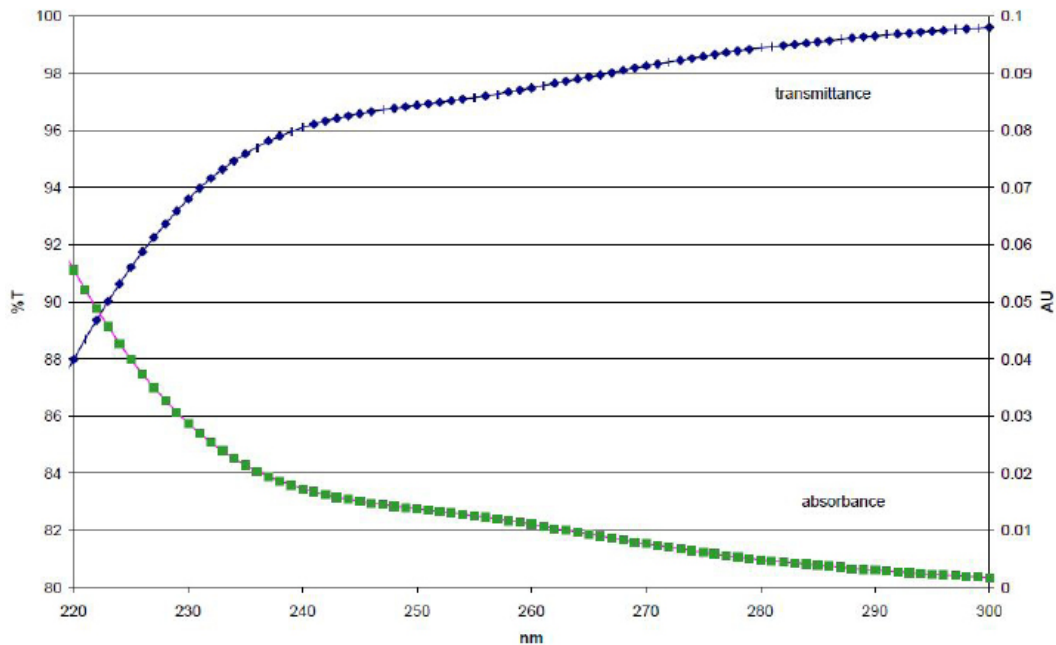
Required Accuracy Threshold

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 ±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.

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.

Measuring Purity of MEG (monoethylene glycol)

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.

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

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

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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