

Application Summary

Analyte: Ethylidene Norbornene (ENB) and Vinyl Norbornene (VNB)

Detector: OMA-300 Process Analyzer and MicroSpec MCP-200 Infrared Photometer

Process Stream: Ethylidene Norbornene (ENB) and Vinyl Norbornene (VNB) Intermediate Product Streams

Introduction

Ethylidene norbornene (ENB) is a color liquid intermediate monomer produced from vinyl norbornene (VNB) which is made from butadiene and dicyclopentadiene. It is commonly used in the production of ethylene-propylene-diene-monomer (EPDM) rubber.

The specifications for evaluating the purity of ENB and VNB include appearance (visual), color, water content and polymerization inhibitor concentration.

Monitoring Ethylidene norbornene (ENB) and Vinyl Norbornene (VNB)

Applied Analytics has developed a powerful, online method to rapidly determine the quality of ENB and VNB using photodiode array spectroscopy and nondispersive infrared photometry. A full spectrum analysis from the OMA allows for monitoring of the UV-Vis spectrum of the sample to determine if impurities are present and control dosage of polymerization inhibitor. The OMA-300 is able to correlate the UV absorbance of the sample to the efficiency of the catalyst and purity of the sample. The MCP-200 measures trace amount of water in ENB and VNB through infrared photometry. Continuous analysis of the properties of the sample allows for tight process control, indication of catalyst efficiency and prompt action in response to impurities in the process.

Total Quality Measurement Solution: Ethylidene Norbornene (ENB) and Vinyl Norbornene (VNB)

Applied Analytics Application Note No. AN-043

An integrated OMA-300/MCP-200 system can measure all quality parameters for ENB and VNB.

ENB Specification

Item	Method	Unit	Specification	Typical
Appearance	Visual Inspection		Pass	Pass
Color	ASTM 1209	Pt-Co	100 max	20
Water	Karl-Fisher	ppm	50 max	30
Composition	GLC	Area %		
Ethylidene norbornene			98.5 min	99.6
Total Lights			1.0 max	0.3
Total Heavies			1.0 max	0.1
BHT inhibitor	GLC	ppm	80 - 200	120

From Nisseki's specifications for ENB, 2004

VNB Specification

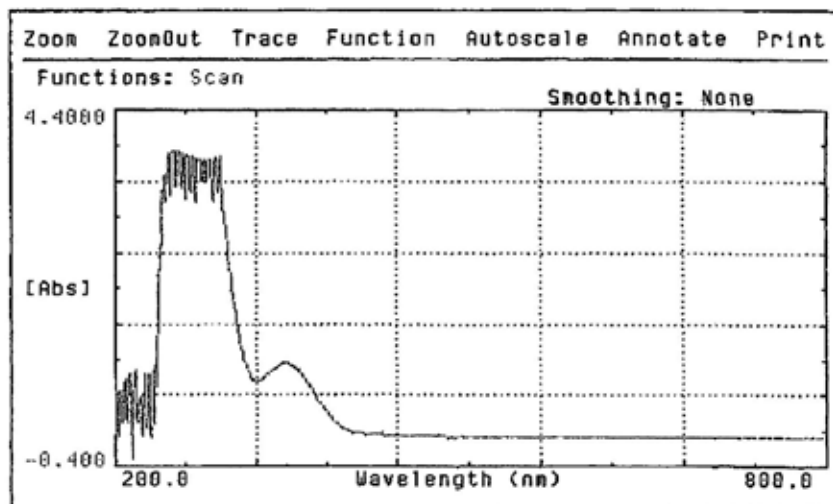
Item	Method	Unit	Specification	Typical
Appearance	Visual Inspection		Pass	Pass
Color	ASTM 1209	Pt-Co	100 max	20
Water	Karl-Fisher	ppm	50 max	30
Composition	GLC	Area %		
Vinyl norbornene			98.5 min	99.6
Total Lights			1.0 max	0.2
Total Heavies			1.0 max	0.2
BHT inhibitor	GLC	ppm	80 - 200	110

From Nisseki's specifications for VNB, 2004

United States Patent: Processes for Correlating UV-Vis Spectra of Norbornene Compound to Polymerization Processes Using the Same, and Related Purification Methods and Compositions

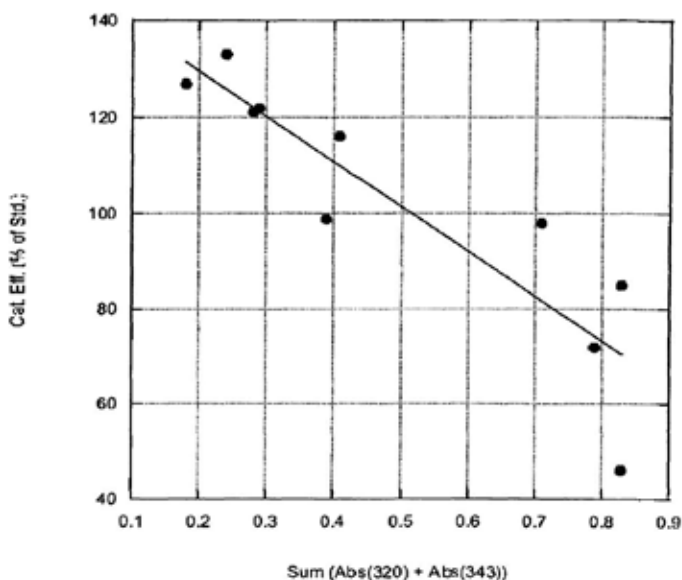
“Applied Analytics, Inc. advertised a rapid, on-line, detection method of impurities in 5-ethylene-2-norbornene by photo diode array spectroscopy. This method was disclosed as being capable of rapidly determining the presence of an impurity by monitoring the absorbance at 320 nm and an internal reference at 343 nm.” – From US Patent No. 8,013,082 B2 (Assignee: Dow Global Technologies LLC)

ENB and VNB Absorbance Spectrum



From US Patent No. 8,013,082 B2 (Assignee: Dow Global Technologies LLC)

Catalyst Efficiency



From US Patent No. 8,013,082 B2 (Assignee: Dow Global Technologies LLC)

Further Reading

Subject	Location
OMA-300 Process Analyzer Data sheet	http://aai.solutions/documents/AA_DS001A_OMA300.pdf
MicroSpec MCP-200 Infrared Analysis Module Data sheet	http://aai.solutions/documents/AA_DS003A_MCP200.pdf
Advantage of Collateral Data Technical Note	http://aai.solutions/documents/AA_TN-202_CollateralData.pdf



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