Designation: D7588 – 11

Standard Guide for FT-IR Fingerprinting of a Non-Aqueous Liquid Paint as Supplied in the Manufacturer's Container[1]

This standard is issued under the fixed designation D7588; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This guide covers the FT-IR fingerprinting of a liquid paint as supplied in the container without the need to separate components. Spectra collected using this technique have been found useful for paint manufacturers' quality control, trouble shooting and to verify that the paint being used is the same as the paint sample tested. This technique has been found useful for both single and multi-component coatings, the latter of which, where each component is analyzed separately (for example, amine cured epoxies and polyol/isocyanate urethanes).

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory requirements prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D2621 Test Method for Infrared Identification of Vehicle Solids From Solvent-Reducible Paints

E131 Terminology Relating to Molecular Spectroscopy

E168 Practices for General Techniques of Infrared Quantitative Analysis

E204 Practices for Identification of Material by Infrared Absorption Spectroscopy, Using the ASTM Coded Band and Chemical Classification Index (Withdrawn 2014)[3]

3. Terminology

3.1 *Definitions*—For definitions of terms and symbols, refer to terminology in Terminology E131.

4. Summary of Guide

4.1 Infrared spectra are collected using an FT-IR spectrophotometer fitted with an ATR crystal, multi or single bounce. Samples are taken directly from the paint container as supplied by the manufacturer.

5. Significance and Use

5.1 The ability to collect an infrared spectrum of a liquid paint as supplied in the container from the manufacturer is of significant importance when performing qualification testing. Historically, fingerprinting a material for such purpose involved separating the components of the paint and collecting an infrared spectrum of one or more of these components (vehicle, pigments, solvent, etc.) with Test Method D2621 being used for the identification of the vehicle. This unfortunately provides information only on the portion of the liquid paint analyzed whereas the technique shown in this practice provides a more complete picture of what is in the container provided. In addition, user expertise and time required to collect a spectrum is minimal versus traditional standards.

6. Apparatus

6.1 *Spectrophotometer*—An FT-IR spectrophotometer with a wavelength range of at least 600 to 4000 cm^{-1} and a resolution no less than 4 cm^{-1}.

6.2 *Multi or Single Bounce Horizontal Attenuated Total Reflectance (ATR) Trough*—For many paint samples, a 45 degree single bounce Fresnel-type ZnSe crystal has been found to provide satisfactory results for most liquid paints. Paint samples unsuitable for this setup will exhibit many 100 % absorptions not to be confused with the 100 % absorptions associated with the spectral cutoff of the instrument optics and crystal material. It should be noted that ATR spectra are influenced by the depth of penetration of the infrared wave into the sample which can be influenced by the type of crystal material. Two spectra obtained using different crystal materials can appear different. For finite comparison of like materials it

[1] This guide is under the jurisdiction of ASTM Committee D01 on Paint and Related Coatings, Materials, and Applications and is the direct responsibility of Subcommittee D01.21 on Chemical Analysis of Paints and Paint Materials.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] The last approved version of this historical standard is referenced on www.astm.org.

is recommended that only spectra obtained with the same crystal material be compared.

7. Procedure

7.1 Ensure that the contents of the container are homogeneous.

7.2 Collect a background infrared spectrum with the ATR trough in place. It is recommended that a new background be collected before the analysis of each sample.

7.3 Fill the trough with the sample and then immediately collect an infrared spectrum from 600 to 4000 cm^{-1} at a resolution of no less than 4 cm^{-1} or as agreed upon between interested parties. This step shall be completed within 1 minute or noted otherwise and sufficient sample shall be used to minimize any effect due to solvent loss and/or reaction with atmospheric components. Very small sample quantities, significantly less than 1 milliltre for example, may be prone to such changes depending on the volatility of any solvents present and reactivity to atmospheric components such as water and/or carbon dioxide.

7.4 Annotate sample infrared spectrum with all information necessary to reproduce the spectrum. This information shall include at a minimum:

7.4.1 Sample identification including product color and IR collection date,

7.4.2 ATR crystal type and configuration, and

7.4.3 Identification of any manipulation of the spectrum such as but not limited to baseline and ATR corrections.

7.5 Compare spectrum to reference spectra as needed.

8. Report

8.1 Properly identify and label the spectrum collected. Identification should include sample name, batch number, date and time, analyst and/or company name, ATR crystal material, ATR apparatus name, spectral correction applied if any, and any other information necessary to duplicate the sampling and/or spectral collection. Example spectra are shown in Figs. 1-5

9. Keywords

9.1 infrared spectra; paint; solvent

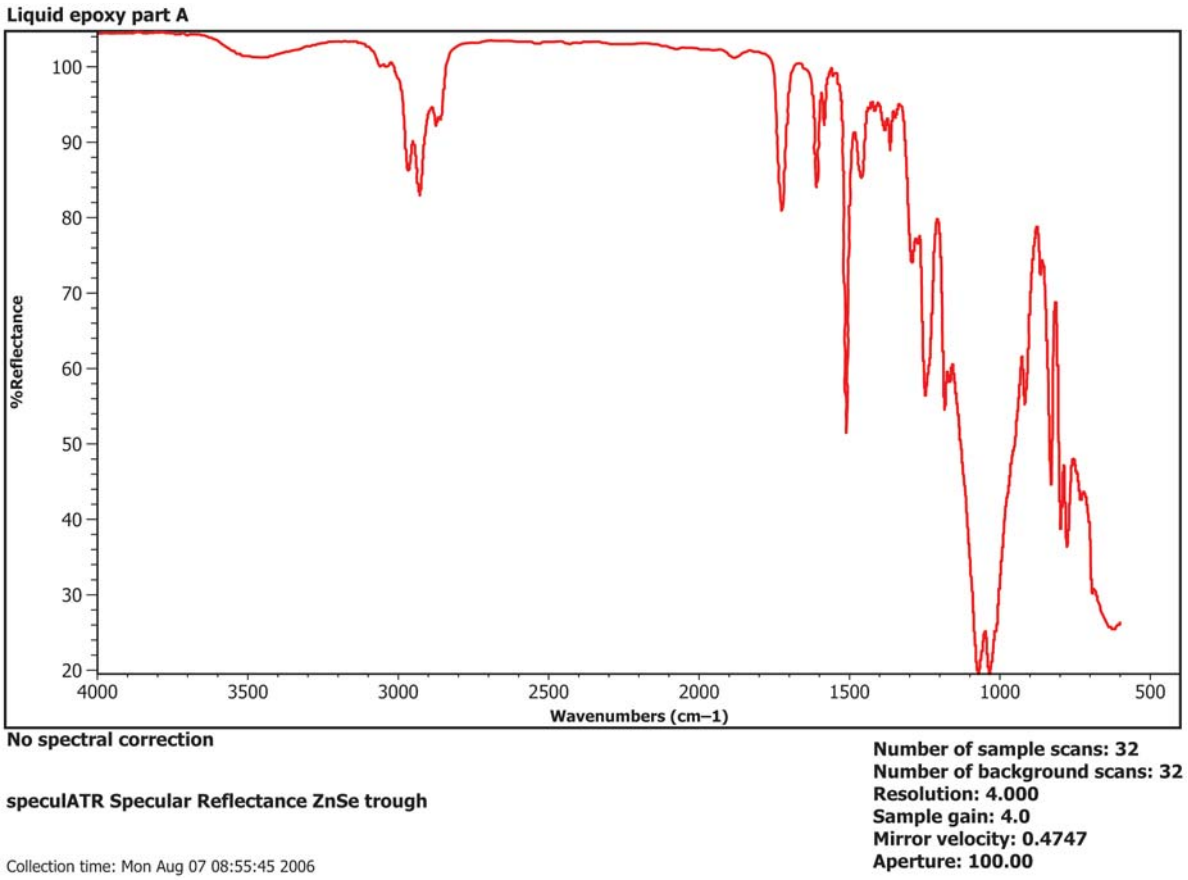

FIG. 1 Liquid Epoxy Part A

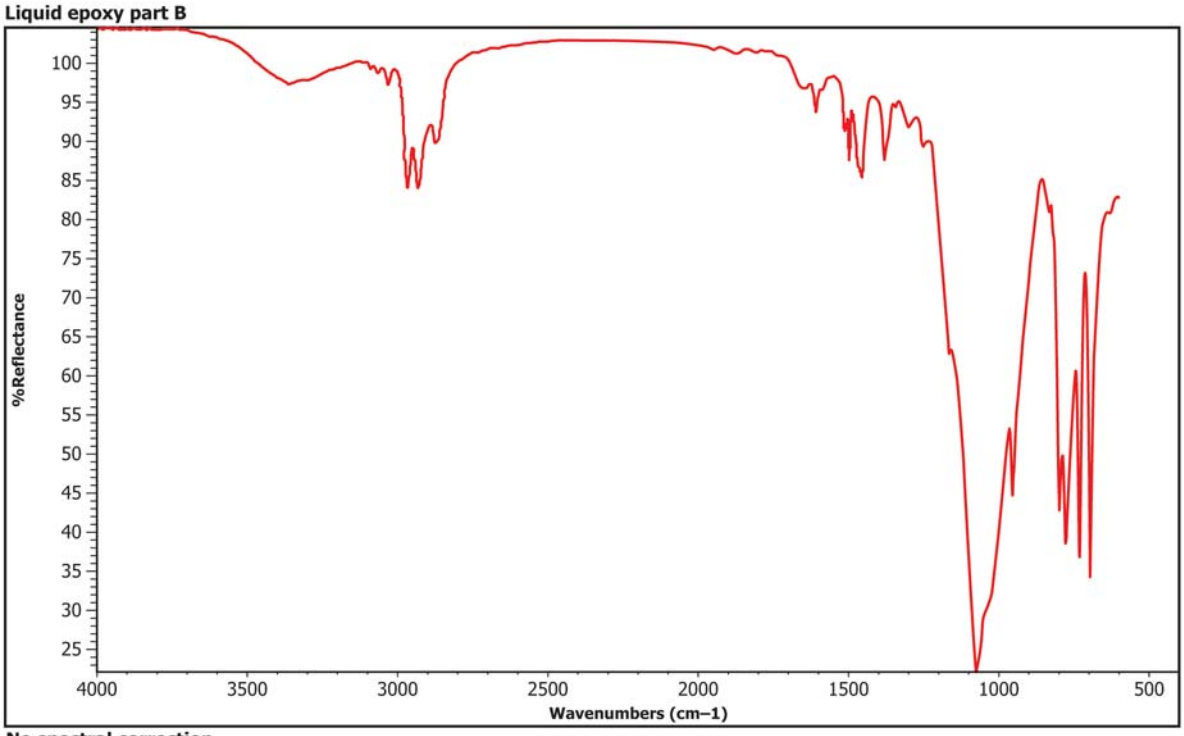

FIG. 2 Liquid Epoxy Part B

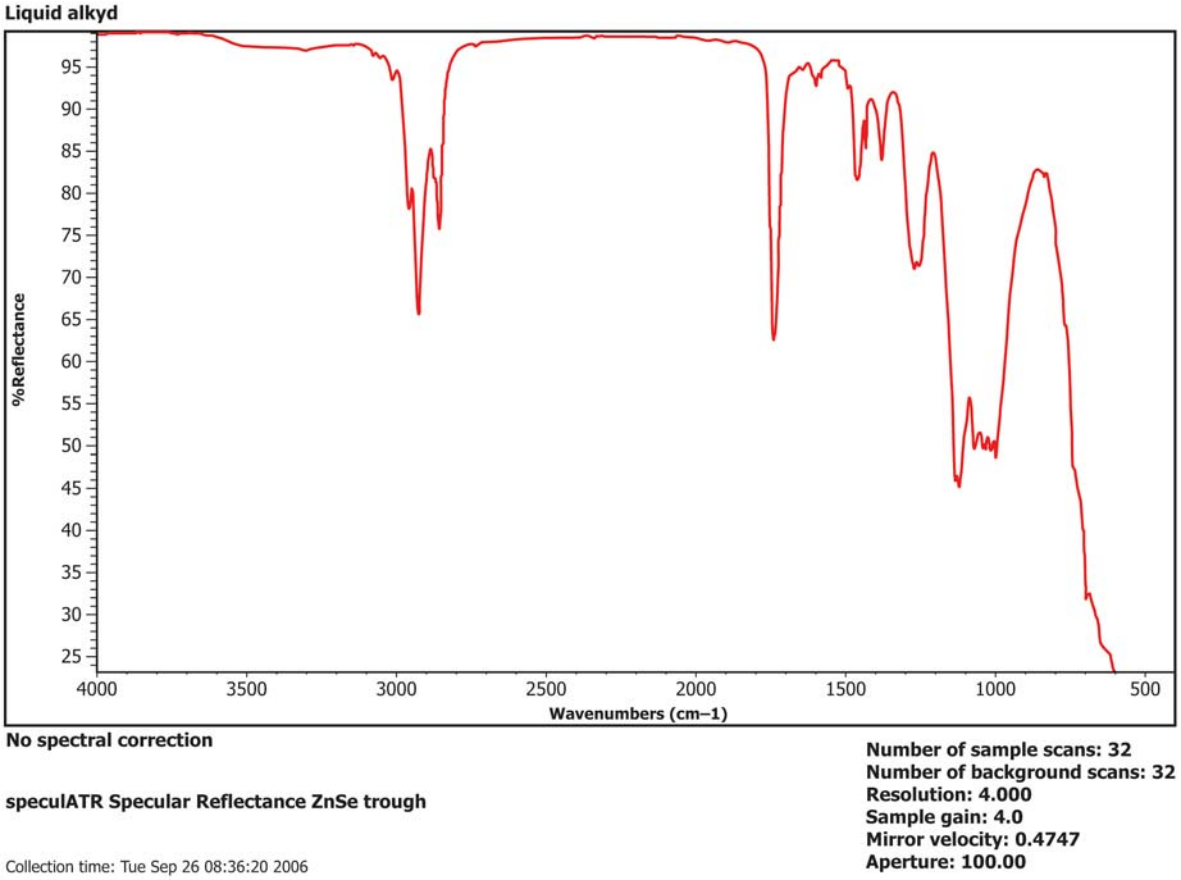

FIG. 3 Liquid Alkyd

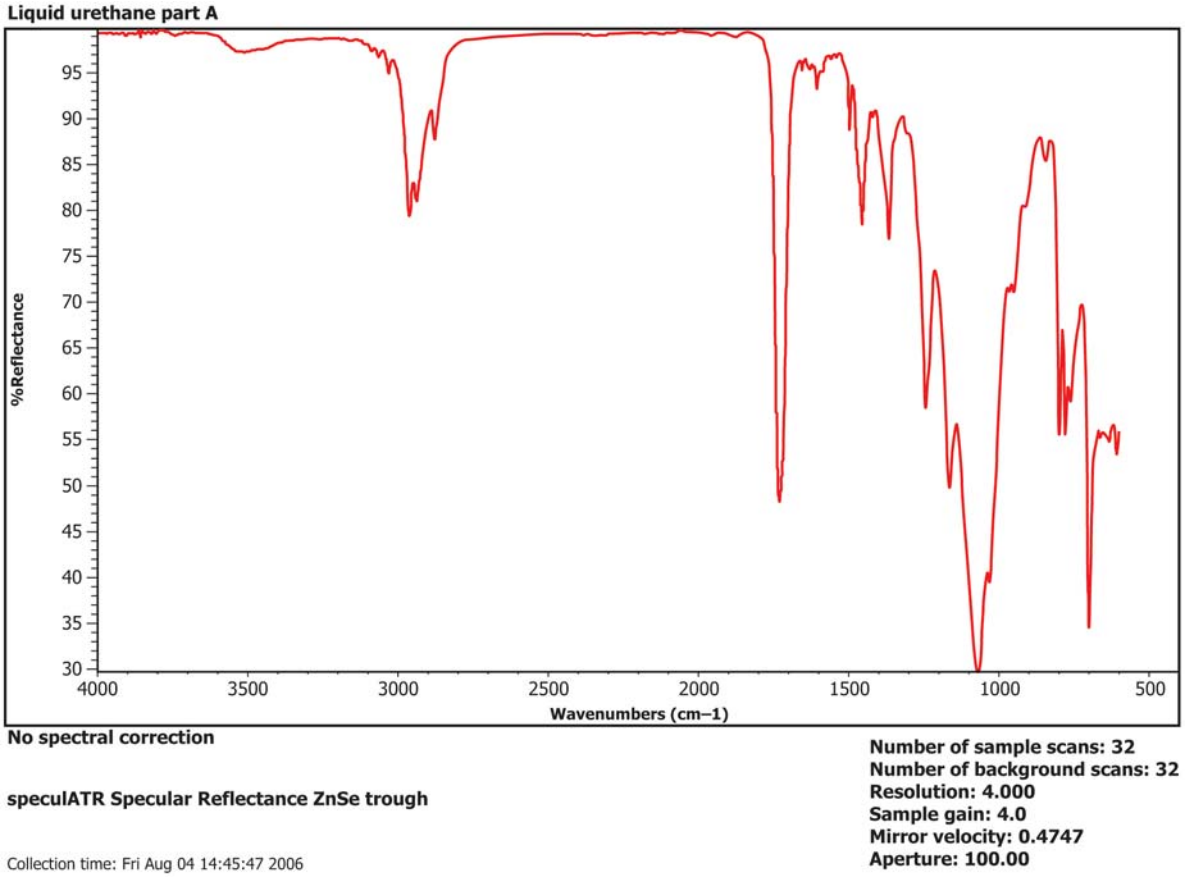

FIG. 4 Liquid Urethane Part A

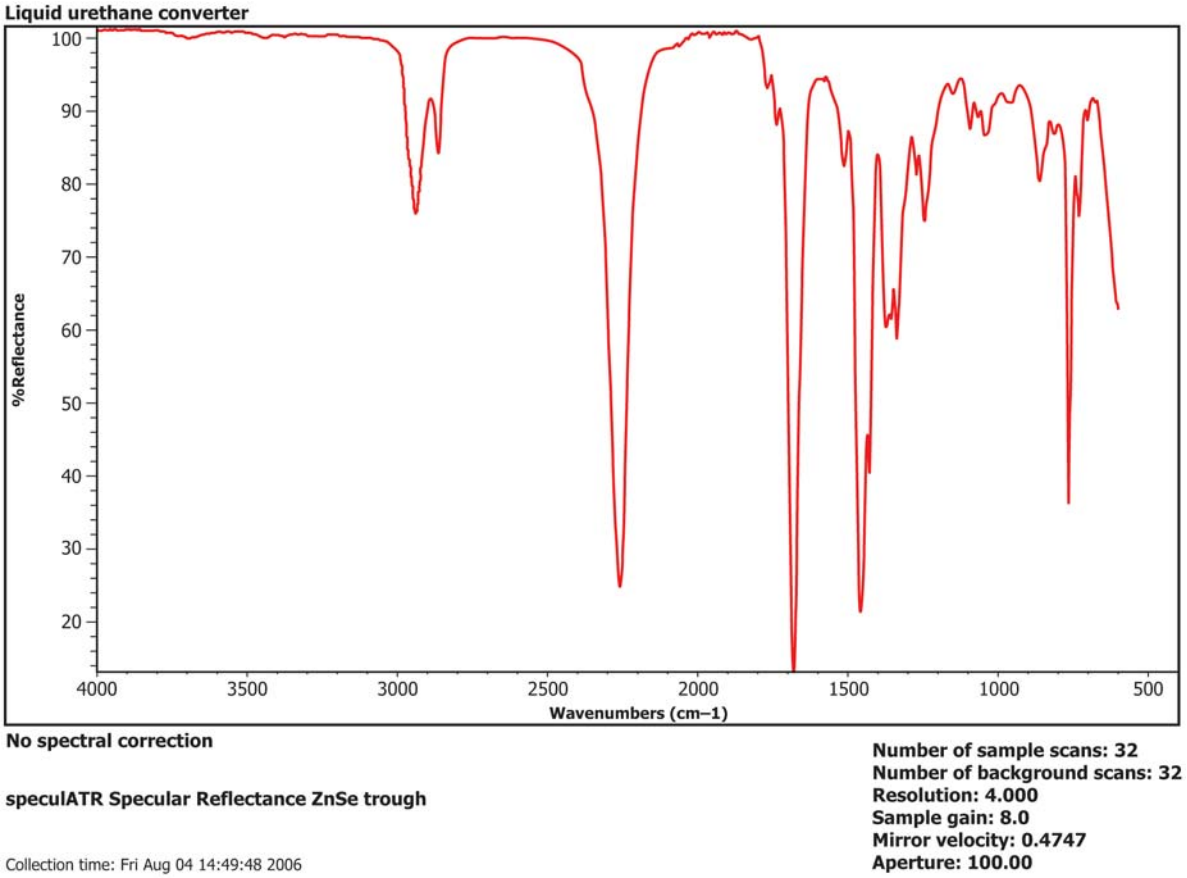

FIG. 5 Liquid Urethane Converter