



Standard Practice for Rubber Chemicals—Determination of Infrared Absorption Characteristics¹

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This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This analytical technique provides a simple, rapid practice to prove the identity of a rubber chemical before incorporation into a rubber mix by comparison of its infrared absorption spectrum with that of a reference specimen.

1.2 This technique can also be used to detect gross contamination or large differences in rubber chemicals. Thus, it can provide a basis for producer-consumer agreement.

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 limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:

E 131 Terminology Relating to Molecular Spectroscopy²

E 168 Practices for General Techniques of Infrared Quantitative Analysis²

E 275 Practice for Describing and Measuring Performance of Ultraviolet, Visible, and Near Infrared Spectrophotometers²

3. Terminology

3.1 **Definitions:** For definitions of terms used in this practice refer to Terminology E 131.

4. Summary of Practice

4.1 A method of specimen preparation is selected that is compatible with the physical and chemical properties of the rubber chemical that will provide the desired spectral information.

4.2 The specimen is placed in the specimen beam of the spectrophotometer and scanned to obtain a spectrum over the region of interest under specified instrument parameters.

4.3 The spectrum is compared with that of a reference specimen. It is understood that the reference specimen was

prepared and scanned in an identical manner and preferably on the same infrared spectrophotometer.

5. Significance and Use

5.1 This procedure can be used for a variety of applications including identifying unlabeled material, process control, raw material acceptance, product evaluation, and compositional change during environmental testing.

5.2 Rubber chemicals vary widely in their chemical and physical properties. Infrared spectrophotometers vary in the presentation of a spectrum (some are linear with absorbance, others with transmittance, some use grating for energy dispersion, others use a sodium chloride prism, etc.). For these reasons a single universal method of specimen preparation and set of instrument parameters is not possible.

5.3 By using a specific sampling procedure and operating conditions, a given double-beam spectrophotometer will give an absorption curve that is characteristic of the rubber chemical or mixture under investigation.

5.4 The ability to superimpose the infrared spectrum of the test specimen upon that of a reference specimen, obtained under the same conditions, is evidence that the two are identical.

5.5 The presence of additional absorption bands in either the test specimen or the reference specimen indicates the presence of one or more additional components.

6. Apparatus

6.1 **Initial Specimen Preparation**—The diverse physical nature of rubber chemicals may require the use of one or more of the following:

6.1.1 *Agate Mortar and Pestle*, small.

6.1.2 *Wig-L-Bug Amalgameter*.³

6.1.3 **Mold and Press for KBr Pellets**—The die size will depend on the disk holder available with the user's infrared spectrophotometer. The hydraulic press should be capable of exerting 140-MPa (20 000-psi) pressure.

6.1.4 *Vacuum Pump* operating at 250 Pa or less.

6.2 **Infrared Spectrophotometer:**

6.2.1 The spectral region from 2.5 to 15 μm (4000 to 667

¹ This practice is under the jurisdiction of ASTM Committee D-11 on Rubber and is the direct responsibility of Subcommittee D11.11 on Chemical Analysis.

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² *Annual Book of ASTM Standards*, Vol 03.06.

³ Available from Crescent Dental and Manufacturing, 7750 W. 47th St., Lyons IL 60534.