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**Standard Method of Test for**

**Evaluation of Oxidation Level of  
Asphalt Mixtures by a Portable  
Infrared Spectrometer**

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**AASHTO Designation: TP 128-22<sup>1</sup>**

Technically Revised: 2022

Editorially Revised: 2022

**Technical Subcommittee: 2c, Asphalt–Aggregate Mixtures**



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## 1. SCOPE

- 1.1. This method covers the measurement of the oxidation signal in an asphalt mixture by a portable infrared spectrometer (PIRS) equipped with a diffuse reflectance accessory. Three oxidation signals are compared: (1) the in-place pavement, (2) asphalt mixture production sample, and (3) the approved job mixture formula specimen. The oxidation signals are determined from a specified peak value from the absorbance spectrum of the asphalt samples.
- 1.2. The in-place pavement PIRS oxidation signal can be used to assess its aging rate. The pavement aging rate is determined by comparing its initial PIRS oxidation signal with successive PIRS oxidation signals obtained at some defined frequency.
- 1.3. *This standard does not purport to address all the safety concerns 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. See Section 12 for more details.*
- 1.4. *The quality of the results produced by this standard are dependent on the competence of the personnel performing the procedure and the capability, calibration, and maintenance of the equipment used. Agencies that meet the criteria of R 18 are generally considered capable of competent and objective testing/sampling/inspection/etc. Users of this standard are cautioned that compliance with R 18 alone does not completely assure reliable results. Reliable results depend on many factors; following the suggestions of R 18 or some similar acceptable guideline provides a means of evaluating and controlling some of those factors.*
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## 2. REFERENCED DOCUMENTS

- 2.1. *AASHTO Standards:*
- R 18, Establishing and Implementing a Quality Management System for Construction Materials Testing Laboratories
  - R 97, Sampling Asphalt Mixtures
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## 3. TERMINOLOGY

- 3.1. *Definitions:*
- 3.1.1. *asphalt oxidative aging rate*—the change of asphalt chemical properties with time where chemical properties are related to the concentration of oxidized functional groups..
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- 3.1.2. *diffuse reflectance Fourier transform infrared spectroscopy (DRIFTS)*—an infrared technique used on rough surfaces where the infrared light is reflected and transmitted at different amounts depending on the bulk properties of the material.
- 3.1.3. *Fourier transform infrared (FTIR) spectrometer*—the most common type of spectrometer used to obtain infrared spectra.
- 3.1.4. *infrared spectroscopy*—the study of the interaction of infrared light with matter.
- 3.1.5. *infrared spectrum*—a plot of the measured infrared intensity versus wavelength.
- 3.1.6. *oxidation signal—OxS*, the calculated value of the infrared absorbance at two specific wavenumbers.

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## 4. SIGNIFICANCE AND USE

- 4.1. The test method described is useful as a rapid, nondestructive technique to monitor and detect differences in the oxidation signal of the preproduction laboratory asphalt mixture, its production at the plant, and the newly placed pavement.
- 4.2. The oxidation values obtained from an asphalt pavement by this test method can be used to determine its aging rate by measuring the pavement oxidation values every six months or at another suitable frequency. Over time, the oxidation values will increase and a pavement aging rate can be obtained.
- 4.3. The test method is useful to measure the oxidation values for monitoring the consistency of asphalt mixtures containing reclaimed asphalt pavement (RAP), recycled asphalt shingles (RAS), or a combination of RAP and RAS.

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## 5. APPARATUS

- 5.1. *Portable Fourier Transform Infrared (FTIR) Spectrometer Equipped with a Diffuse Reflection Accessory:*
  - 5.1.1. The spectrometer should be equipped with a portable battery to ensure a reliable power supply during testing.
- 5.2. *Laboratory Sampling Equipment:*
  - 5.2.1. Suitable metal scoop and containers to obtain asphalt mixture samples as described by R 97.
  - 5.2.2. Stainless steel pipes for filling and compacting the asphalt mixture samples. Suitable dimensions are a minimum diameter of 25 mm (1 in.) and a height of 51 mm (2 in.). These tubes can accommodate nominal-maximum aggregate sizes (NMAS) of 19 mm or less. Larger-diameter tubes may be used for other NMAS.
  - 5.2.3. Ordinary hammer with a steel head, or any other suitable device, to compact the asphalt mixture specimen in the stainless steel pipe to obtain a flat surface.
  - 5.2.4. Standard sieves No. 4 (4.75 mm), No. 8 (2.36 mm), and No. 30 (0.6 mm) for sieving the test specimen material from a sample of the loose asphalt mixture.
  - 5.2.5. Soft cloth or tissue for cleaning the PIRS device.