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Standard Test Methods for Rubber Deterioration—Reference and Alternative Method(s) for Determining Ozone Level in Laboratory Test Chambers[1]

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INTRODUCTION

Numerous techniques exist for the analysis of gaseous ozone in ozone-air mixtures used for ozone crack testing of rubber. These include wet chemical procedures, electrochemical cells, UV absorption, and chemiluminescence with ethylene. See Refs (**1-4**).[2]

Wet chemical methods (the absorption of ozone in a potassium iodide solution and titration of the iodine released with sodium thiosulfate) have been in traditional use in the rubber industry, but they are not suitable for continuous operation, and in recent years they have been shown to be sensitive to small variations in test procedures and concentration and purity of reagents. Interlaboratory tests have indicated that different procedures do not give equivalent results, and most of them differ from an absolute UV method. Frequently, wet chemical methods yield higher ozone concentrations due to the oxidizing capacity of other components of the ozone-air mixture.

Certain nonreference instrumental methods are amenable to automatic operation and for this reason they are included in this standard. They may be used for routine testing once calibrated against the reference UV method.

UV absorption is adopted as the reference method against which the others shall be calibrated. It is an absolute test method and is in common use by environmental protection agencies for the determination of pollutant ozone in air (see 2.3).

Although these test methods are concerned with ozone analysis, it also draws attention to the influence of atmospheric pressure on the rate of cracking of rubber at constant ozone concentration as normally expressed in terms of parts by volume. As described in Appendix X2, the variation in ozone resistance that can result between laboratories operating at significantly different atmospheric pressures can be eliminated by specifying ozone concentration in terms of the partial pressure of ozone.

1. Scope

1.1 These test methods cover the following three types of methods for the determination of ozone content in laboratory test chambers. Method A (UV absorption) is specified for reference or referee purposes and as a means of calibration for the alternative methods; Method B, instrumental device (electrochemical or chemiluminescence); and Method C, wet chemical techniques (see Appendix X1). These methods are primarily intended for use with tests for determining rubber ozone cracking resistance and thus are applicable over the ozone level range from 25 to 200 mPa.

NOTE 1—Prior to 1978, ozone concentrations were expressed in ASTM D11 Standards in parts per hundred million (pphm) of air by volume. See Appendix X2 for an explanation of the change to partial pressure in millipascals (mPa).

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 limitations prior to use. For a specific hazard statement, see Note 2 and 5.1.*

NOTE 2—**Warning—Ozone is a hazardous chemical.**

[1] These test methods are under the jurisdiction of ASTM Committee D11 on Rubber and are the direct responsibility of Subcommittee D11.15 on Degradation Tests.

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[2] The boldface numbers in parentheses refer to the list of references at the end of this standard.

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