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Standard Guide for Measurement of Polyolefin Properties Using TD-NMR Relaxometry¹

This standard is issued under the fixed designation D8539; 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 is intended to provide suggested approaches and criteria for the determination of polyolefin properties via time-domain Nuclear Magnetic Resonance (TD-NMR) Relaxometry. Though any crystallinity or morphology related property can be determined using this method (1), (2)², the focus of this guide is on the prediction of Xylene Solubles content for polypropylene and density (3) for polyethylene as these are the most commonly specified properties for polyolefin manufacturers. Please note that other properties such as flexural modulus, Izod, Charpy, intrinsic viscosity, decalin/hexane solubles and others can be determined as well.

1.2 *High-Level Purpose*—The purpose of this guide includes:

(1) educating new users on the use of TD-NMR Relaxometry to determine properties of polyolefins in manufacturing plants and laboratories;

(2) providing a standard terminology that can be used by different vendors and end users;

(3) establishing minimum requirements for apparatus, data acquisition, analysis, calibration and validation;

(4) providing guidance for the specification, evaluation, cost justification, implementation, project management, training, and documentation of TD-NMR Relaxometers; and

(5) providing a functional requirements checklist for TD-NMR Relaxometers for use in polyolefin plants and laboratories that can be integrated with existing systems.

1.3 *Audience*—This guide has been created with the needs of the following stakeholders in mind:

(1) end users of TD-NMR Relaxometers for use in polyolefin plants and laboratories,

(2) implementers of TD-NMR Relaxometers for use in polyolefin plants and laboratories,

(3) quality personnel,

(4) information technology personnel,

(5) vendors of TD-NMR Relaxometers for use in polyolefin plants and laboratories,

(6) individuals who approve funding of TD-NMR Relaxometers for use in polyolefin plants and laboratories,

(7) applications support specialists for TD-NMR Relaxometers used in polyolefin plants and laboratories, and

(8) software test/validation specialists.

1.4 Information contained in this guide will benefit a broad audience of people who interact with a TD-NMR Relaxometer used in polyolefin plants and laboratories. New users can use this guide to understand the purpose and functions of TD-NMR Relaxometers for use in polyolefin plants and laboratories as well as the interactions between these tools with external systems. The guide might also help prospective users in understanding terminology, configurations, features, design, benefits, and costs of these analyzers. Individuals who are purchasing TD-NMR Relaxometers for use in polyolefin plants and laboratories may also use this guide to identify functions that are recommended for specific laboratory environments. Research and development staff of different commercial laboratory informatics system vendors may use the guide as a tool to evaluate, identify, and potentially improve the capabilities of their products. The vendors' sales staff may use the guide to represent functions of their laboratory informatics products to prospective customers in more generic and product-neutral terms.

1.5 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

NOTE 1—There is no known ISO equivalent to this standard guide.

1.6 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

¹ This test method is under the jurisdiction of ASTM Committee D20 on Plastics and is the direct responsibility of Subcommittee D20.70 on Analytical Methods.

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