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.

Designation: D7646 – 23

Standard Test Method for Determination of Cooling Characteristics of Aqueous Polymer Quenchants for Aluminum Alloys by Cooling Curve Analysis[1]

This standard is issued under the fixed designation D7646; 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 test method covers the description of the equipment and the procedure for evaluating quenching characteristics of aqueous polymer quenchants by cooling rate determination.

1.2 This test method is designed to evaluate aqueous polymer quenchants for aluminum alloys in a non-agitated system. There is no correlation between these test results and the results obtained in agitated systems.

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

1.4 *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.*

1.5 *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.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D4175 Terminology Relating to Petroleum Products, Liquid Fuels, and Lubricants

D6200 Test Method for Determination of Cooling Characteristics of Quench Oils by Cooling Curve Analysis

E220 Test Method for Calibration of Thermocouples By Comparison Techniques

E230 Specification for Temperature-Electromotive Force (emf) Tables for Standardized Thermocouples

2.2 *ISO Standards:*[3]

ISO 3819 Laboratory Glassware—Beakers

2.3 *Japanese Industrial Standards:*[4]

JIS K 2242 Heat Treating Oil

2.4 *Wolfson Engineering Group Specification:*[5]

Laboratory Tests for Assessing the Cooling Curve of Industrial Quenching Media

3. Terminology

3.1 *Definitions:*

3.1.1 For definitions of terms used in this test method, refer to Terminology D4175.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *aqueous polymer quenchant, n*—aqueous solution containing a water soluble polymer; typically including poly(alkylene glycol), poly(ethyl oxazoline), poly(sodium acrylate) and poly(vinyl pyrrolidone). The quenchant solution also typically contains additives for corrosion and foam control, if needed. Quench severity of aqueous polymer quenchants is dependent on concentration and molecular weight of the specific polymer being evaluated, quenchant temperature, and agitation rate.

3.2.2 *characteristic temperature, n*—transition temperature from vapor blanket phase (film boiling phase) to rapid cooling phase (nucleate boiling phase) on cooling curve.

3.2.3 *cooling curve, n*—cooling curve is a graphical representation of the cooling time (t)–temperature (T) response of the probe (see 7.3). An example is illustrated in Part B of Fig. 1.

3.2.4 *cooling curve analysis, n*—the process of quantifying the cooling characteristics of a heat treating oil based on the

[1] This test method is under the jurisdiction of ASTM Committee D02 on Petroleum Products, Liquid Fuels, and Lubricants and is the direct responsibility of Subcommittee D02.L0.06 on Non-Lubricating Process Fluids.

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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] Available from SAE International (SAE), 400 Commonwealth Dr., Warrendale, PA 15096, http://www.sae.org.

[4] Available from Japanese Standards Association (JSA), Mita MT Bldg., 3-13-12 Mita, Minato-ku, Tokyo 108-0073, Japan, http://www.jsa.or.jp.

[5] Available from Wolfson Heat Treatment Centre, Aston University, Aston Triangle, Birmingham B4 7ET, England, http://www.sea.org.uk/whtc/.

*A Summary of Changes section appears at the end of this standard

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