Designation: F706 – 96 (Reapproved 2011)

Standard Practice for Determination of Fusion Temperature of Dry Electrostatic Heat-Fixing Toners[1]

This standard is issued under the fixed designation F706; 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 practice covers a procedure that is used to determine the fusion temperature of dry electrostatic heat-fixing toners using a micro hot stage.

1.2 *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.* See Section 7 for specific precautionary statements.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D2117 Test Methods for Carbon Black—Surface Area by Nitrogen Adsorption (Withdrawn 1999)[3]

F335 Terminology Relating to Electrostatic Imaging

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *fusion point*—in a dry electrostatic heat fixing toner, the minimum temperature at which the solid material starts to exhibit a plastic flow.

4. Significance and Use

4.1 Dry electrostatic heat-fixing toners may be composed of polymer binders, black pigments, and other such additives that are necessary for the proper performance for the use intended, particularly in those copiers using heat-fusing techniques for image fixing. Toners characteristically do not have a sharp melting point but instead exhibit a broad temperature range of melting.

4.2 The user should be aware that the fusion point is one of several physical characteristics of certain heat-fixing toners. Similar fusion temperature results obtained through this practice on two different toners (between lots or from one manufacturer to another) should not be considered a guarantee of equal performance characteristics when subsequently utilized in a copier.

5. Apparatus

5.1 *Micro Hot Stage and Microscope* , controlled, of 40 to 50× power[4] or suitable alternative.[5]

6. Materials

6.1 *Test Reagent Set*, containing substances with known micromelting points for checking the accuracy of the micro hot stage thermometer.[6]

7. Precautions

7.1 The user should be aware that not all heat-fixing toners exhibit a uniform plastic flow. Some toners will exhibit a rapid initial plastic flow while other toners may exhibit a slower, gradual plastic flow.

8. Sampling

8.1 The dry toner to be tested should be free of any clumps of toner. Should any clumps of toner be present that cannot be broken up under the gentle pressure of a spatula, reject the toner sample and choose another.

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[1] This practice is under the jurisdiction of ASTM Committee F05 on Business Imaging Products and is the direct responsibility of Subcommittee F05.04 on Electrostatic Imaging Products.

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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] The last approved version of this historical standard is referenced on www.astm.org.

[4] The sole source of supply of the apparatus (Kofler Micro Hot Stage) known to the committee at this time is Arthur H. Thomas Co., Philadelphia, PA. (All equipment necessary for this test, including the microscope and the variable transformer, are included.) If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,[1] which you may attend.

[5] The Fisher-Johns instrument or the Mettler FP-2, operated in accordance with the manufacturer's instructions and used with a microscope of 40 to 50× power has been found suitable for use.

[6] The sole source of supply of the apparatus known to the committee at this time is Arthur H. Thomas Co., Philadelphia, PA. If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,[1] which you may attend.

9. Calibration

9.1 The micro hot stage apparatus and the thermometer should be checked regularly with test reagents having known melting points. To ensure maximum accuracy, record at least three readings over the range of the thermometer. Make a calibration chart using a minimum of three readings and plot the actual reading obtained against the correct temperature found for the thermometer used.

9.2 The dial of the heat control (variable transformer) of the micro hot stage apparatus is generally graduated. Therefore, it is essential that the temperature gradient produced by the various settings of the control be predetermined to enable a specific heating to be maintained when making fusion point determinations. These temperature gradients should be periodically checked and any revisions with regard to the heat control dial and rate of heating should be recorded.

10. Procedure

10.1 Using a spatula, transfer several grains of the toner to be tested onto a microscope slide or cover glass, dropping the toner to form a pile on one spot.

10.2 Cover the toner sample with a cover glass and carefully place the sample assembly on the micro hot stage. Follow the manufacturer's instructions on use of the micro hot plate, regarding any other special instructions.

10.3 Adjust the microscope (lamp or mirror, or both) for best viewing and focus the microscope to bring the selected toner sample into sharp detail using 40 to 50× power. Do not change the focus during the following steps.[7]

10.4 Turn on the micro hot stage heat control (variable transformer) and set the control so that the stage will heat to within 10°C below the expected fusion point of the sample at a rate of approximately 3°C/min.

10.5 When the stage reaches approximately 10°C below the expected fusion point, reset the heat control so that the temperature of the stage increases approximately 2°C/min.

10.6 Using the microscope, observe the toner sample on the hot stage and record the temperature at the point where fusion has started.

10.7 Where applicable, use temperature corrections to adjust the readings recorded. Record both the observed fusion point temperature and the corrected fusion temperature (if applicable).

10.8 It is suggested that the user also include as a control reference, a toner of a known fusion point temperature. This reference toner will serve as a check on the method for possible variation in either the equipment or the observed end point. This reference toner should not vary for fusion point temperature by more than ±2°C from previous tests established on the reference toner.

11. Report

11.1 The report shall include the following:

11.1.1 Observed fusion point temperature,

11.1.2 Corrected fusion point temperature (if applicable), and

11.1.3 Description of reference toner (if used).

12. Keywords

12.1 fusion point; melt point; toners

[7] A suggested microscope is available from Arthur H. Thomas Co., Philadelphia, PA, catalog number 6548-516. Any suitable alternative microscope is acceptable that has a magnification range from 40 to 50× power.