Designation: F2250 – 13

Standard Practice for Evaluation of Chemical Resistance of Printed Inks and Coatings on Flexible Packaging Materials[1]

This standard is issued under the fixed designation F2250; 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 describes the procedure for evaluating the ability of an ink, overprint varnish or coating to withstand chemical exposure. Typical chemicals, which may come in contact with the package, include water, alcohol, acid, etc. The specific chemical and method of choice as well as determination of measurement outcome are left to users to agree upon in joint discussion. Suggestions for ways to measure and collect information are offered in the various methods listed in this practice.

1.2 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the 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.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

E171 Practice for Conditioning and Testing Flexible Barrier Packaging

3. Significance and Use

3.1 Packaging materials may be exposed to chemicals such as water, alcohol, acid, etc. during their life cycle. If it is anticipated that the packaging material will be exposed to a chemical, it is important that the ink or coating, or both, not degrade, soften, or dissolve as a result of that contact.

3.2 The testing included in this practice is applicable to surface printed and coated materials designed to be resistant to a specific chemical.

3.3 The chemicals to be tested should be compatible with (that is, not damage or degrade) the substrate being printed or coated, or both.

3.4 There are four separate methods detailed in this practice. The methods represent increasing degrees of severity from Method A to Method D. Selection of method should be based on the type of exposure anticipated. For example, the pouring method (Method A) is typically used where incidental exposure is anticipated, such as a spill or splash of chemical on the material surface. Method B or C is typically used when chemical resistance is desired depending on the level of exposure (B) and abrasion (C) anticipated. Method D would represent continual contact between the chemical and material and would need to be chemical-proof, (for example, if the package were to be submerged in the chemical and exposed to abrasion over a period of time.)

3.5 This practice does not address acceptability criteria. These need to be jointly determined by the user and producer of the product, based on the type of exposure that is anticipated.

4. Apparatus

4.1 *Method A Apparatus:*

4.1.1 Inclined plane capable of holding material at approximately a 45-degree angle, allowing chemical to be tested to flow easily downward.

4.1.2 Small pouring container or syringe of chemical to be tested.

4.2 *Method B Apparatus:*

4.2.1 Watch glass, sized to cover sample to be tested and easily handled.

4.2.2 Small pouring container or syringe of chemical to be tested.

4.2.3 Timing device.

4.2.4 Absorbent material.

[1] This practice is under the jurisdiction of ASTM Committee F02 on Flexible Barrier Packaging and is the direct responsibility of Subcommittee F02.20 on Physical Properties.

Current edition approved May 1, 2013. Published June 2013. Originally approved in 2003. Last previous edition approved in 2008 as F2250 – 03 (2008). DOI: 10.1520/F2250-13.

[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.

4.3 *Method C Apparatus:*
4.3.1 Cotton swab.
4.3.2 Container of chemical to be tested.

4.4 *Method D Apparatus:*
4.4.1 Watch glass, sized to cover sample to be tested and easily handled.
4.4.2 Small pouring container or syringe of chemical to be tested.
4.4.3 Timing device.
4.4.4 Wipe or cotton swab.

5. Sampling

5.1 The number of samples tested should be adequate to be predictive of performance. Caution should be taken when eliminating samples with defects as this can bias results.

6. Conditioning

6.1 Conditioning of the samples will depend on the material under evaluation. If conditioning before testing is appropriate, normal, and desirable, refer to Specification E171 for guidance.

6.2 Before testing catalyzed or cured inks or coatings, ensure that the samples have been exposed to the appropriate conditions for sufficient time to allow complete cure.

7. Procedure

7.1 *Method A—Pouring Method:*
7.1.1 Cut sample to be tested. Cut a sample of the material in the area of interest, approximately 13 by 13 cm or 5 by 5 in. To test larger printed or coated areas, or both, multiple samples may need to be cut.
7.1.2 Attach sample to inclined plane (approximate 45-degree angle) Position so that the applied chemical does not pool on the test area. When attaching the sample take care that it is smooth without wrinkles, creases, or folds. The surface to be evaluated (the printed or coated side, or both) should be facing up.
7.1.3 Pour or squirt the chemical along the elevated edge of sample, so that it covers and runs over the entire area of the sample.
7.1.4 Examine the printed or coated sample, or both, for any running, smearing, or discoloration. Also look at the runoff pooled chemical for any discoloration.
7.1.5 Record results in user specified format. For example, results may be recorded as pass (no change)/fail or as a degree or percentage of damage.

7.2 *Method B—Timed Exposure Method:*
7.2.1 Cut sample to be tested. Cut a sample of the material in the area of interest, approximately 13 by 13 cm or 5 by 5 in. To test larger printed or coated areas, or both, multiple samples may need to be cut.
7.2.2 Lay the sample on a flat surface taking care that it is smooth without wrinkles, creases, or folds. The surface to be evaluated (the printed or coated side) should be facing up.
7.2.3 Pour or squirt chemical evenly over area to be tested.
7.2.4 Place watch glass over wet sample and set timing device. A one minute exposure may be used for this method.

NOTE 1—The time should be based on the anticipated length of exposure or, if ranking materials, then multiple time intervals should be used.

7.2.5 When specified time has elapsed, carefully remove glass and examine sample for any running, smearing or discoloration.
7.2.6 Blot gently with absorbent material. Examine absorbent wipe for any transfer of ink or coating and the sample for any smearing or discoloration.
7.2.7 Record results in user specified format. For example, results may be recorded as pass (no change)/fail or as a degree or percentage of damage.

7.3 *Method C—Wiping Method:*
7.3.1 Cut a sample of the material in the area of interest, approximately 13 by 13 cm or 5 by 5 in. To test larger printed or coated areas, or both, multiple samples may need to be cut.
7.3.2 Lay the sample on a flat surface taking care that it is smooth without wrinkles, creases, or folds. The surface to be evaluated (the printed or coated side) should be facing up.
7.3.3 Saturate a swab with chemical to be used for test.
7.3.4 Place the chemical-soaked swab on the sample and rub in a back-and-forth motion with a light pressure. Each stroke should be approximately 3 in.

NOTE 2—Significant pressure variation may affect test results.

7.3.5 For reporting purposes, users may choose to count the number of strokes that it takes for the ink/coating to begin to smear, lighten or transfer to the swab. In this case, a back-and-forth motion is counted as two strokes.
7.3.6 When using this method to rank materials, the report may log the number of strokes achieved before failure. When performing routine Q.A. testing, the product specification may require the material to survive a minimum number, such as 10 strokes. The number of strokes may vary depending on specific applications and agreed upon specifications. Results may also be reported as Pass/Fail.

7.4 *Method D—Wipe Method after Timed Exposure:*
7.4.1 Cut a sample of the material in the area of interest, approximately 13 by 13 cm or 5 by 5 in. To test larger printed or coated areas, or both, multiple samples may need to be cut.
7.4.2 Lay the sample on a flat surface taking care that it is smooth without wrinkles, creases, or folds. The surface to be evaluated (the printed or coated side) should be facing up.
7.4.3 Pour or squirt chemical evenly over area to be tested.
7.4.4 Place watch glass over wet sample and set timing device. Five minutes is a typical time exposure for this method.

NOTE 3—The time should be based on the anticipated length of exposure or, if ranking materials, then multiple time intervals should be used.

7.4.5 When specified time has elapsed, carefully remove glass and examine sample for any running, smearing or discoloration.
7.4.6 Blot gently with wipe. Examine wipe for any transfer of ink or coating.
7.4.7 Place a swab or wipe on the sample and rub in a back-and-forth motion with a light pressure. Each stroke should be approximately 3 in.

NOTE 4—Significant pressure variation may affect test results.

7.4.8 For reporting purposes, users may choose to count the number of strokes that it takes for the ink/coating to begin to smear, lighten or transfer to the swab or wipe. In this case, a back-and-forth motion is counted as two strokes.

7.4.9 When using this method to rank materials, the report may log the number of strokes achieved before failure. When performing routine Q.A. testing, the product specification may require the material to survive a minimum of strokes. Again, these approaches may be recorded as Pass/Fail.

8. Report

8.1 Lot number and source of material, date, time, location and operator of test and complete identification of materials being tested.

8.2 Chemical(s) tested and method used.

8.3 Any conditioning of the materials.

8.4 Any and all deviations from standard.

9. Keywords

9.1 alcohol resistance; chemical resistance