



Standard Practice for Measuring the Dark Stability of Ink Jet Prints¹

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1. Scope

1.1 This practice describes an accelerated procedure intended to determine the dark stability of ink jet prints.

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.*

2. Referenced Documents

2.1 ASTM Standards:

D 2244 Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates²

2.2 ANSI Standards:

ANSI/NAPM IT9.9-1990 Stability of Color Photographic Images—Methods for Measuring³

3. Terminology

3.1 Definitions:

3.1.1 *ink jet media*, *n*—recording elements used by ink jet printers to receive inks. The substrate may be paper, plastic, canvas, fabric, or other ink receptive material. The substrate may, or may not, be coated with an ink receptive layer(s).

3.1.2 *single accelerated test*, *n*—dark stability testing at a single set of environmental conditions, for example 50°C and 50 % relative humidity (RH).

4. Summary of Practice

4.1 Printed test samples are covered with a polyethylene terephthalate (PET) sleeve⁴ to simulate an album, or with a sample of the same sample type to simulate a stack of prints, and placed in foil-lined bags. Air is forced out of the bags and the bags are sealed. The bags are placed in dark recirculating forced-air environmental chambers at 50°C/50 % RH and 24°C/50 % RH and the color change of the samples is then measured over time.

NOTE 1—The foil bags serve several purposes: they protect the samples, they prevent any outgassing from the samples from contaminating other samples in the test chamber, and they ensure contact of the PET or receiver to the samples.

4.2 The duration of the incubation may vary widely depending on the dark stability of the ink/media.

4.3 During the course of the test, the color changes in the printed samples are periodically evaluated instrumentally. Results are compared to a control incubated at room conditions and to the same specimen prior to incubation. The color change is reported as percent retained optical density and color difference, ΔE .

4.4 The test may be continued for a specific duration of time or until a predetermined color difference has been achieved.

5. Significance and Use

5.1 Dark stability of printed ink jet media for specified periods of time is pertinent to the end use of these materials. While natural aging is the most reliable method of assessing image stability, the length of time required makes this practice impractical for most materials. As a result, accelerated tests often are used. This practice is an accelerated short-term storage practice that simulates long-term storage but at elevated temperature. It provides faster results and is intended to identify problems that may occur over extended time periods. A room condition sample also is tracked to provide practical data. Because testing is done at a single set of conditions, it is not intended to be a long-term predictor as achieved through Arrhenius testing.

NOTE 2—The results from single accelerated tests can lead to inaccurate results. This procedure should be used only for early-screening information in side-by-side comparisons only. Arrhenius testing, which is based on mathematical extrapolation of a series of high temperature tests to room temperature, is a better predictor of a product's stability.⁵

5.1.1 Since the ability of an ink jet print to withstand color changes is a function of temperature and humidity, it is important that dark stability be assessed under the conditions appropriate to the end use application. While ink jet prints may be handled and displayed under a variety of conditions, this test practice is intended to produce the color changes that may

¹ This practice is under the jurisdiction of ASTM Committee F05 on Business Imaging Products and is the direct responsibility of Subcommittee F05.07 on Ink Jet Imaging Products.

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² *Annual Book of ASTM Standards*, Vol 06.01.

³ American National Standards Institute, Inc., 11 West 42nd Street, New York, NY 10036.

⁴ Kodak Image Sleeve Cat. 160-0733.

⁵ S. Anderson and D. Kopperl, "Limitations of Accelerated Image Stability Testing," *Journal of Imaging Science and Technology*, 37: 363-373 (1993).