



Conserve O Gram

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Identification Of Film-Base Photographic Materials

Many museum and archival collections contain valuable photographic collections.

Unfortunately, some film-base material found in this type of collection is unstable and rapidly deteriorates when stored improperly. Film deterioration can also harm nearby film and artifacts, creates a health threat, and is irreversible. Identify your collection's film type(s) to collect information needed for preservation planning. This *Conserve O Gram* contains a number of film identification testing methods to distinguish between the three most common film types.

Types of Film-Base Photographic Material

Manufacturers have produced three common types of film bases: cellulose nitrate, the cellulose acetates (acetate, diacetate, and triacetate), and polyester. While polyester is stable, cellulose nitrate and the cellulose acetates are not. Degrading cellulose nitrate emits toxic fumes, and becomes increasingly more dangerous as it deteriorates. Prolonged

storage at high temperatures greatly increases the risk of combustion. (See *Conserve O Gram* 14/8, "Caring for Cellulose Nitrate Film.")

Furthermore, cellulose nitrate deterioration ruins the image carried on the film base, destroying the historic information that it contains. Cellulose acetate - "safety film" - emits acetic acid fumes (vinegar syndrome) as it deteriorates. These fumes will cause damage to adjacent materials, but unlike cellulose nitrate, the deterioration products will not cause image deterioration.

Test Techniques

The identification tests are listed in order from the least to the most destructive. Non-destructive techniques are listed first. If you make a positive identification with one test you should confirm your results with a second test. Only use the destructive tests if you cannot get a positive identification using non-destructive methods.

Edge Markings

Edge markings are words printed by the manufacturer on the border of some film to identify the film type. Some manufacturers marked the film by type, like "nitrate," while others include their brand name, like "Kodak Nitrate Film." The words to look for are "nitrate," "safety," "safety film," "Estar," and "Cronar." Remember that there may be no edge marking at all.

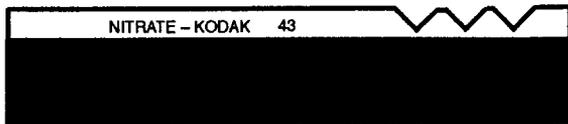
Note: Your film may be a copy negative, and edge printing on the original negative may have been copied onto the new negative. Therefore, just because you see the word "nitrate" does not necessarily mean that it is. You may also see both "nitrate" and "safety" printed on the edge. This indicates that your negative is a cellulose acetate copy of nitrate film.

Edge Marking:

word "Nitrate," and negative is original -----
word "Safety," and negative is original -----
words "Estar" or "Cronar" -----

Film Type:

cellulose nitrate
cellulose acetate
polyester



Notch Codes

Notch codes are small notches cut along one edge of the film border by the manufacturer to help photographers identify the film type in a darkroom. The notch codes described here are based on those used for Kodak film before 1949.

Notch Code on Border:

"V"-shaped notch, first notch from edge ----- cellulose nitrate
 "U"-shaped notch, first notch from edge ----- cellulose acetate

Film Type:

Deterioration Characteristics

Cellulose Nitrate	Cellulose Acetate	Both	Deterioration Level
no deterioration	no deterioration	no deterioration	0
yellow hue, mirroring		curl, red or blue colors	1
nitric acid odor, sticky	acetic acid (vinegar) odor	shrinkage, brittle	2
amber hue, image fade		warping, orange dots	3
soft	bubbles, crystals		4
stuck to adjacent item, brown hue	channeling		5

Dating Information

Conserve O Gram 14/3, "Chronology of Photographic Processes," contains a chart that outlines when different film-base materials were available. Use this *Conserve O Gram* if you have information about the date of the film from sources such as:

- photographer's data
- information in the image
- other archival records

Polarization Test

This test will identify polyester film.

Supplies: Two polarizing filters or two pairs of sunglasses with polarizing lenses and a strong light source.

Instructions: Place the film between the two filters or polarized sunglass lenses, and cross the filters so that light barely passes through them. Hold the lenses and film to the light.

Result:

dimmed light and no colors ----- cellulose nitrate or cellulose acetate
 shimmering, rainbow-like patterns ----- polyester

Film Type:

Destructive Test Techniques

The following are destructive tests. **Do not conduct destructive tests without instruction and training** from an individual experienced with using these tests (archivist, conservator, curator); you could cause harm to your collection or to yourself. All of these tests use

chemicals, so always conduct these tests under a fume hood, or outdoors wearing an acid/organic vapor rated cartridge in a respirator you have had fit-tested. Read Materials Safety Data Sheets (MSDS) for the chemical reagents. **NEVER** perform these tests where other collections are stored.

Float Test

This destructive test identifies nitrate, acetate, or polyester film.

Supplies: Test tube, trichloroethylene, and a 6 mm square of film cut from a film border.

Note: trichloroethylene is a volatile chemical and a known carcinogen. Use with extreme care.

Instructions: Fill the test tube with the trichloroethylene and add the film strip. Cover and shake.

Result:	Film Type:
film floats to the top -----	cellulose acetate film
film hovers in the middle -----	polyester film
film sinks to the bottom-----	cellulose nitrate film

The results of this test may be difficult to interpret because deteriorated acetate film may sink to the bottom like nitrate film. If the results are inconclusive, test again. If results are again not conclusive, continue testing.

Diphenylamine Test

This destructive test identifies cellulose nitrate film. **Note:** the sulfuric acid solution can be irritating to mucous membranes.

Supplies: A solution made from 100 ml of 90% sulfuric acid slowly added to .5 gm of diphenylamine, a microscope slide, and a small sample of film.

Instructions: Place the film sample on the microscope slide and apply a drop of the prepared solution. Check results after 60 seconds. (*Test continued on next page*)

Result:	Film Type:
film turns a deep blue -----	cellulose nitrate
film remains clear or has only a tinge of blue -----	cellulose acetate or polyester

Note: Sometimes the film sample will exhaust the solution and no blue color will form. Always add two more drops to a sample that tests negative for nitrate, then wait 60 seconds and check the results again.

Burn Test

This destructive test will identify nitrate.

Supplies: You will need a film snippet, a match, and a pair of long-handled tweezers.

Instructions: Hold the film with the tweezers, light the end of the film with the match.

Result:

flame burns brightly and is entirely consumed ----- cellulose nitrate

fire smolders and leaves a dripping mess ----- polyester or cellulose acetate

Note: Use a second test to identify and confirm polyester or cellulose acetate.

Film Type:

Bibliography

Nishimura, Douglas W. "Film Supports: Negatives, Transparencies, Microforms, and Motion Picture Film." In *Storage of Natural History Collections: A Preventive Conservation Approach*. Iowa City, Iowa: Society for the Preservation of Natural History Collections, 1995.

Reilly, James M. *Care and Identification of 19th Century Photographic Prints*. Rochester, N.Y.: Eastman Kodak Co., 1986.

Sources

This *Conserve O Gram* is based on the approach presented in Fischer, Monique C. and Andrew Robb. "Guidelines for Care and Identification of Film-Base Photographic Materials" in *Topics in Photographic*

Preservation, Vol. 5, Washington, D.C.: AIC Photographic Materials Group (1993). NPS units can find additional information in *NPS Museum Handbook*, Part I, Appendix M: Cellulose Nitrate and Ester Film and Appendix R: Care of Photo Collections.

Polarizing filters are available from quality photographic supply stores.

Test tubes, microscope slides, sulfuric acid, diphenylamine and trichlorethylene:

Fisher Scientific
7722 Fenton Street
Silver Spring, MD 20910
(800) 766-7000

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