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Film Materials, Formats and Processes

Reto Kromer • AV Preservation by reto.ch

On the Materiality of Audio-Visual Heritage

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Observations

- 16 mm
- black and white
- reversal
- silent
- cellulose diacetate



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Common Film Formats

professional formats

- 35 mm, Super 16

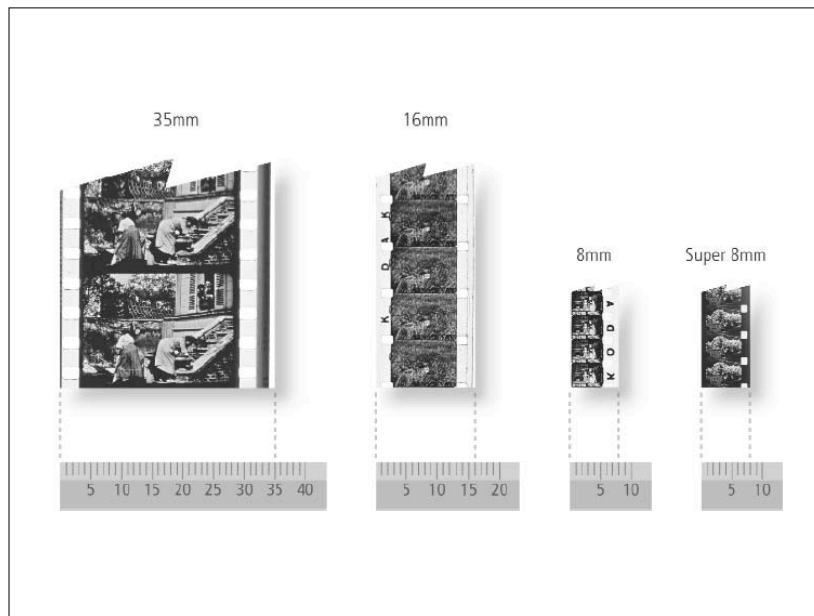
universal format

- 16 mm

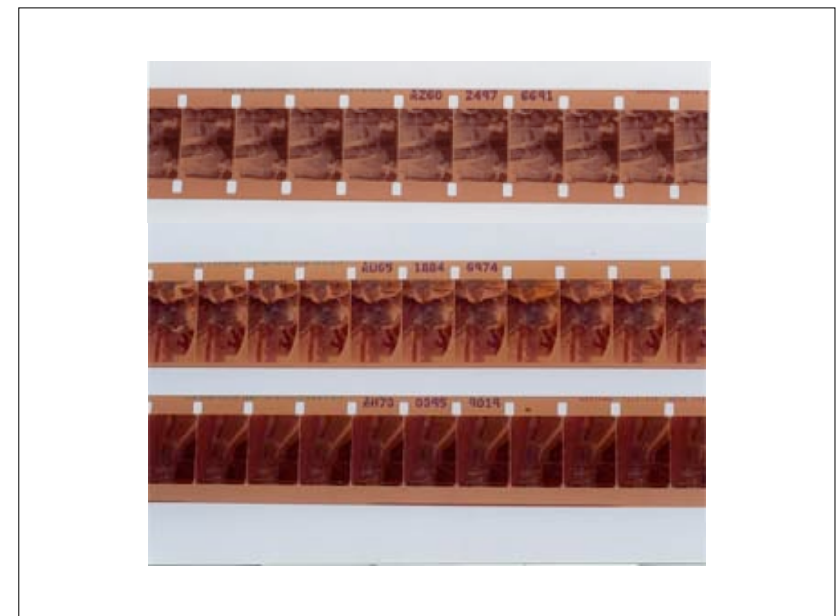
amateur formats

- 9.5 mm, 8 mm, Super 8

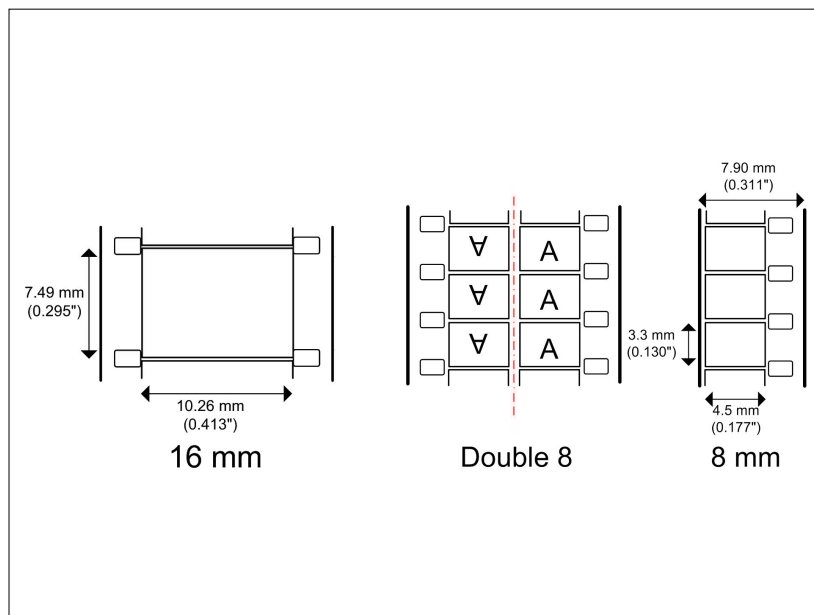
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Common Magnetic Formats

audio

- 2", 1", 1/2", 1/4"

cinema

- 35 mm, 17.5 mm, 16 mm, 8 mm

video

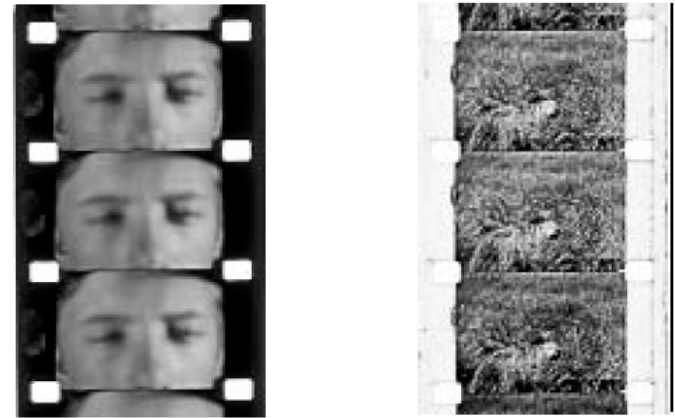
- 2", 1", 3/4", 1/2"

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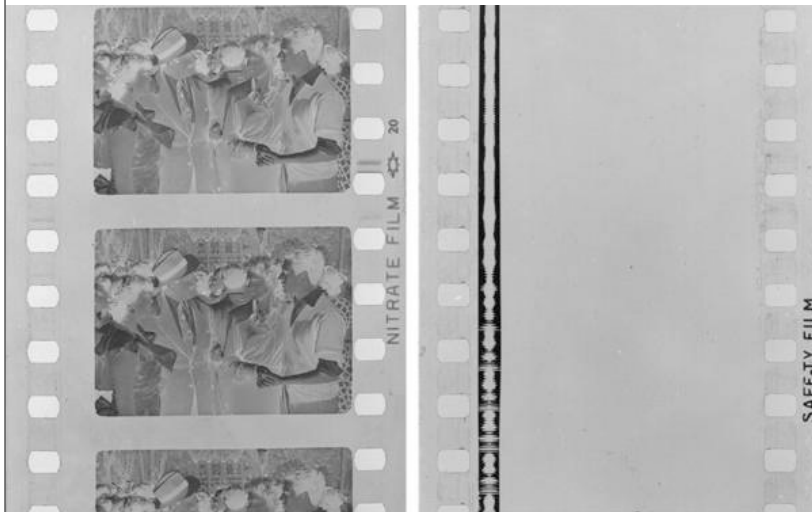
Film Polarity

- negative/positive
- reversal

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"Silent Film" Sound

- musical improvisation
- cue sheet
- "Kinemathek"
- score
- film narrator or Benshi
- voices from behind the screen
- sound effects
- sound on disc or tape cassette

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Sound Film

comopt = composite optical sound print
(variable density or variable area)

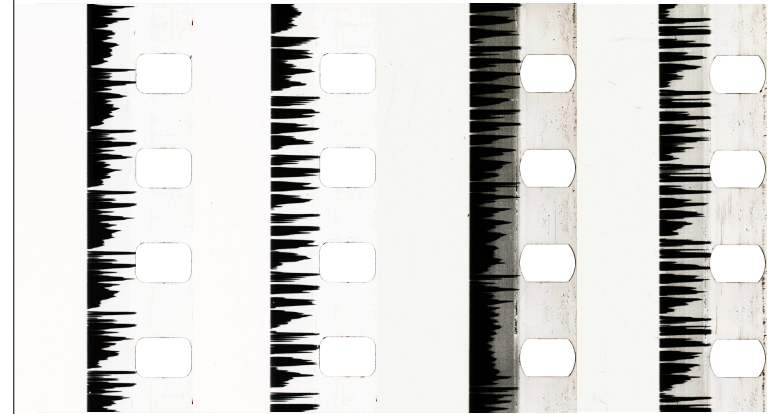
commag = composite print with magnetic
stripe

sepmag = magnetic sound only

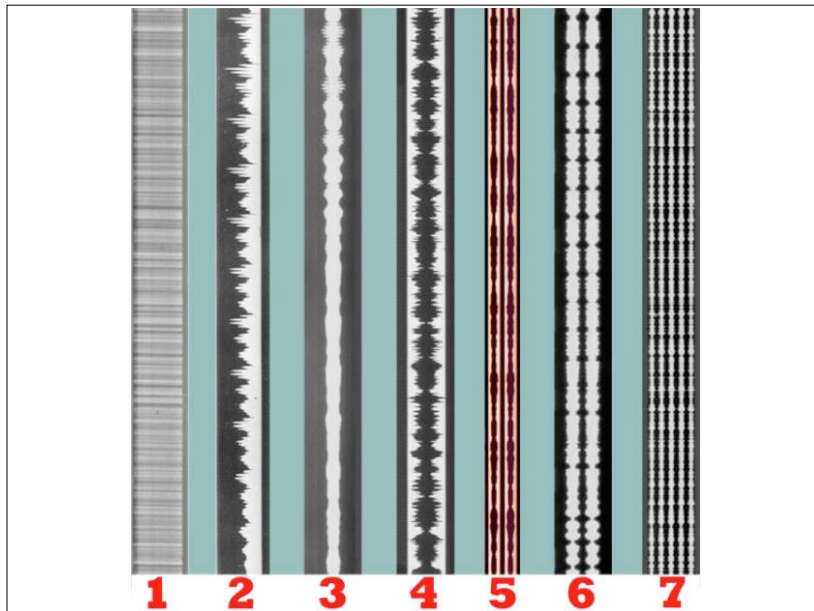
sepopt = optical sound only print

magopt = both optical and magnetic sound on
one film

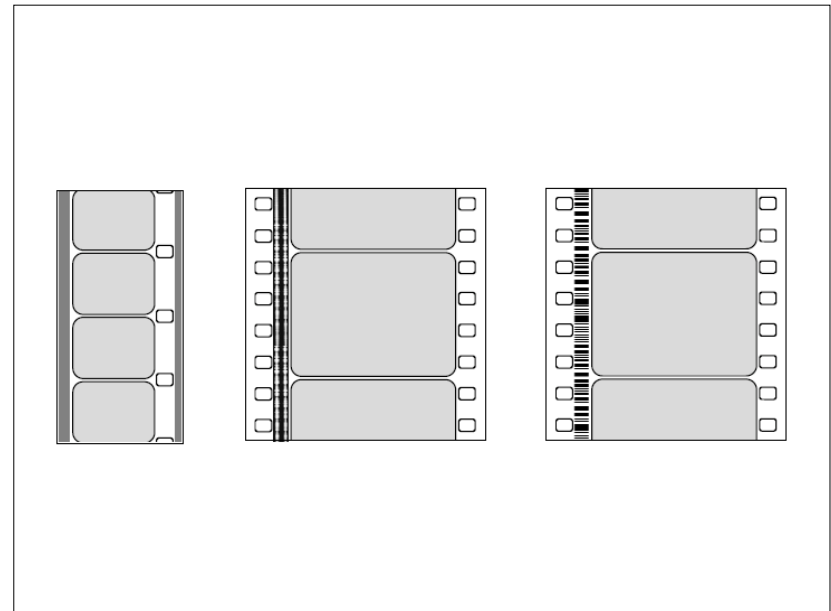
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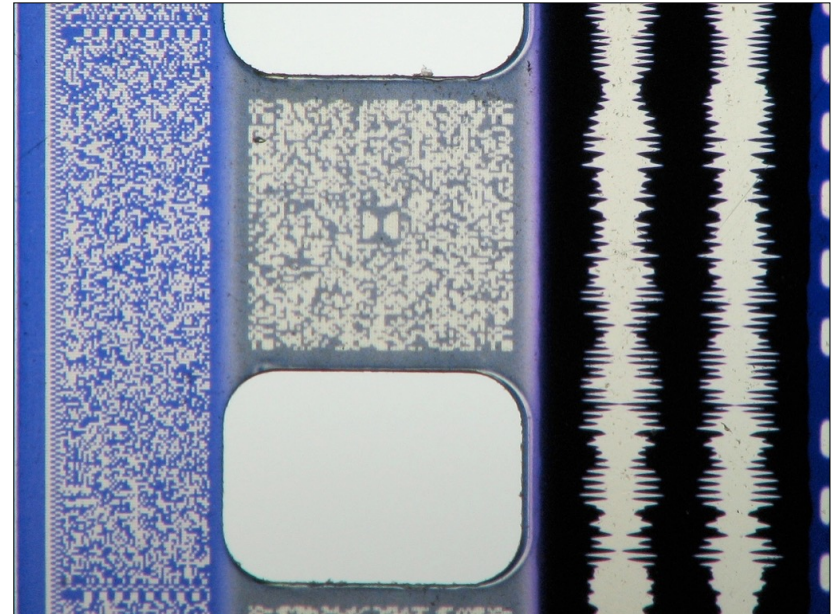
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Sound Film Production

image	sound
photochemical	photochemical
photochemical	magnetic
photochemical	digital
photochemical + digital	digital
digital	digital

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Flavours of Film Colour

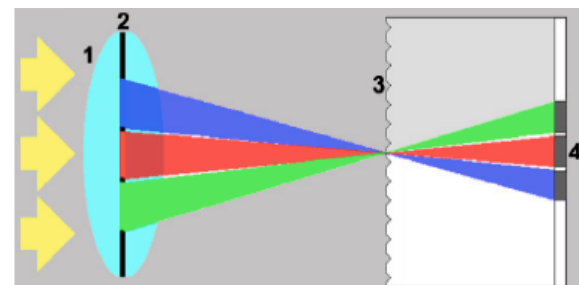
- hand coloured
- stencil
- tinting
- toning
- additive colour
- subtractive colour

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lenticular film



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Dufaycolor



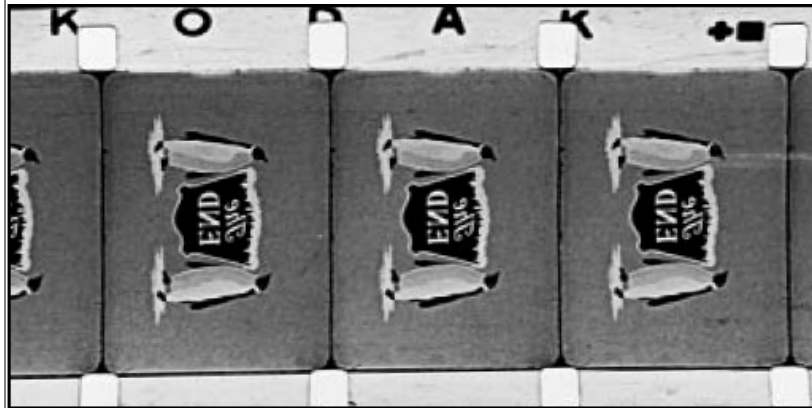
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Other Information

- raw stock: manufacturer and type
- type of camera
- image format
- wind (winding A; winding B)
- generation/type of element: camera original, print, internegative, interpositive, dupe neg, fine grain; A and B rolls (sometimes more)
- Filmographic data in titles and credits; people, places, etc.

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Edge code



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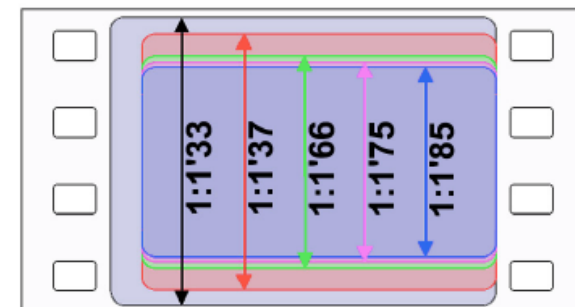
EASTMAN KODAK DATE CODE CHART

1922	1942	1962	●■	1982	●■X
1923	1943	1963	●▲	1983	X▲X
1924	1944	1964	▲■	1984	▲■▲
1925	1945	1965	■●	1985	■●▲
1926	1946	1966	▲●	1986	▲●▲
1927	1947	1967	■▲	1987	■▲▲
1928	1948	1968*	●●●	1988	++▲
1929	1949	1969	+	1989	X+▲
1930	1950	1970	▲+	1990	▲+▲
1931	1951	1971	●+	1991	X+X
1932	1952	1972	■+	1992	■+▲
1933	1953	1973	+▲	1993	+▲▲

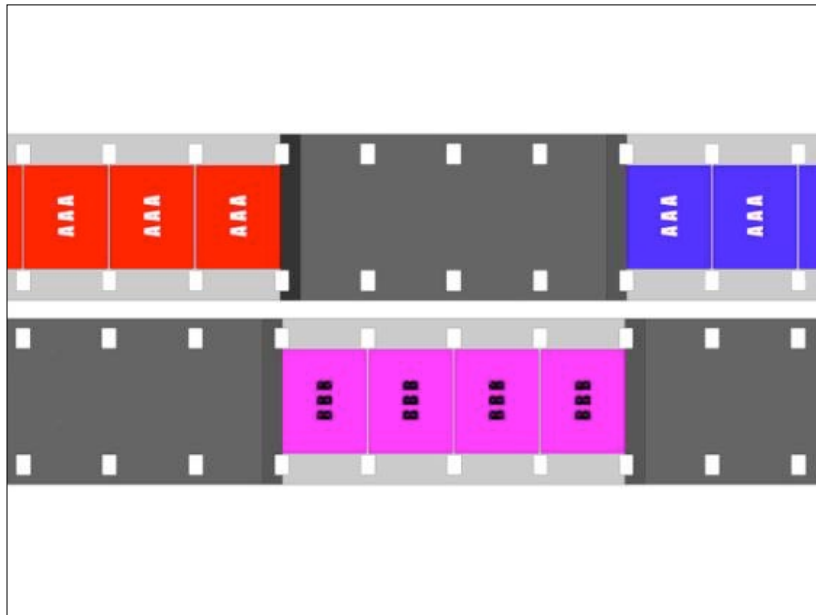
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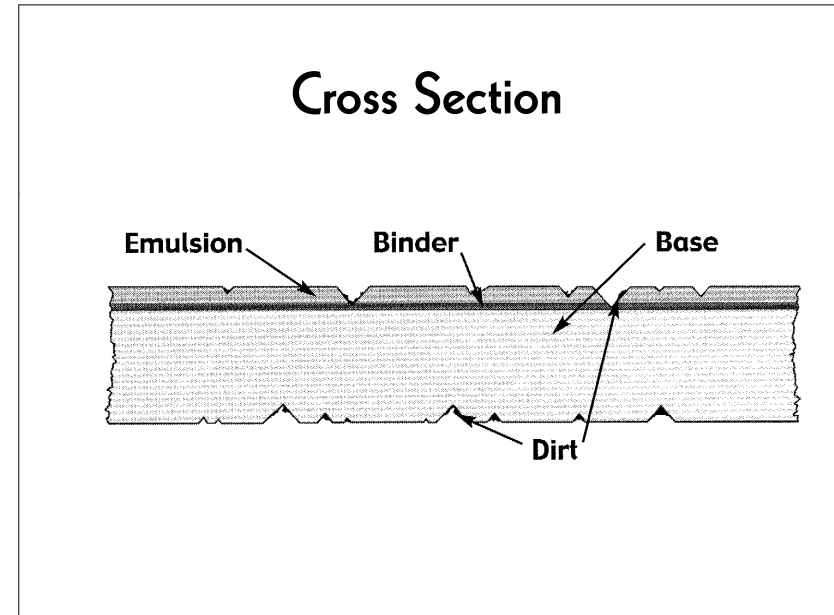
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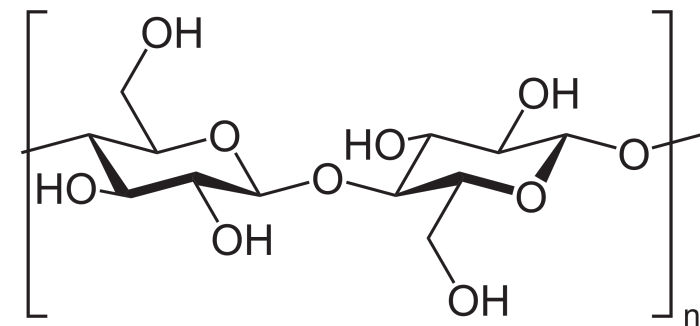
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Film Base

- cellulose nitrate
- cellulose diacetate
- cellulose triacetate
- polyester

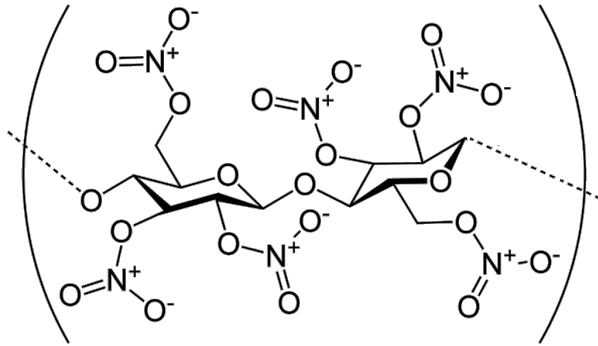
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Cellulose



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Nitrocellulose



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Nitrocellulose

advantages:

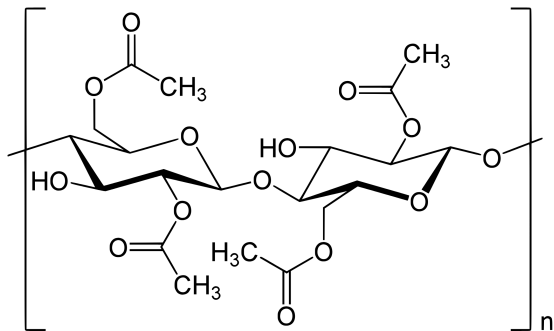
- excellent transparency
- best flexibility

disadvantages:

- highly flammable
- out-gasses nitric acid

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Cellulose Acetate



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Cellulose Diacetate

advantages:

- lower flammability than nitrate (but still flammable)

disadvantages:

- becomes brittle at low temperatures
- pronounced shrinkage in dry conditions
- out-gasses acetic acid ("vinegar syndrome")

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Cellulose Triacetate

advantages:

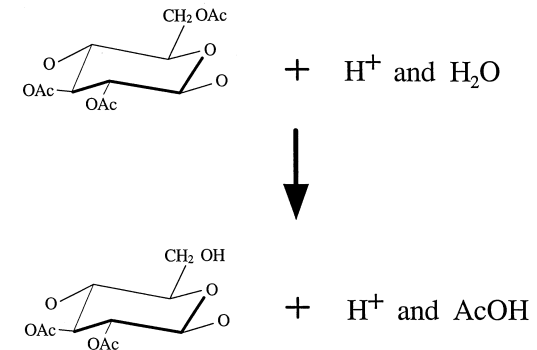
- low flammability
- easily cement spliced

disadvantages:

- out-gasses acetic acid ("vinegar syndrome")

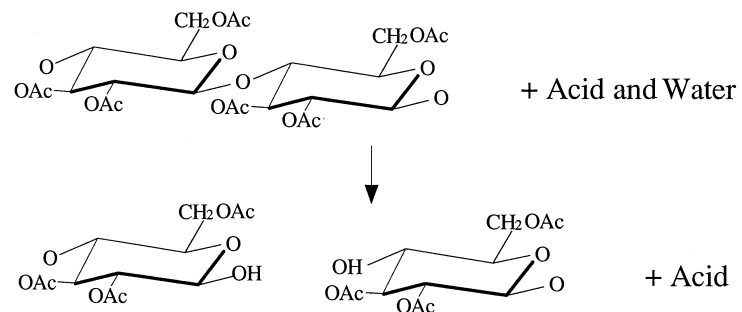
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Acid Catalysed Hydrolysis



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Glycosidic Cleavage by Hydrolysis



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Polyester

advantages

- strongest and most stable carrier
- manufactured without solvents
- does not shrink

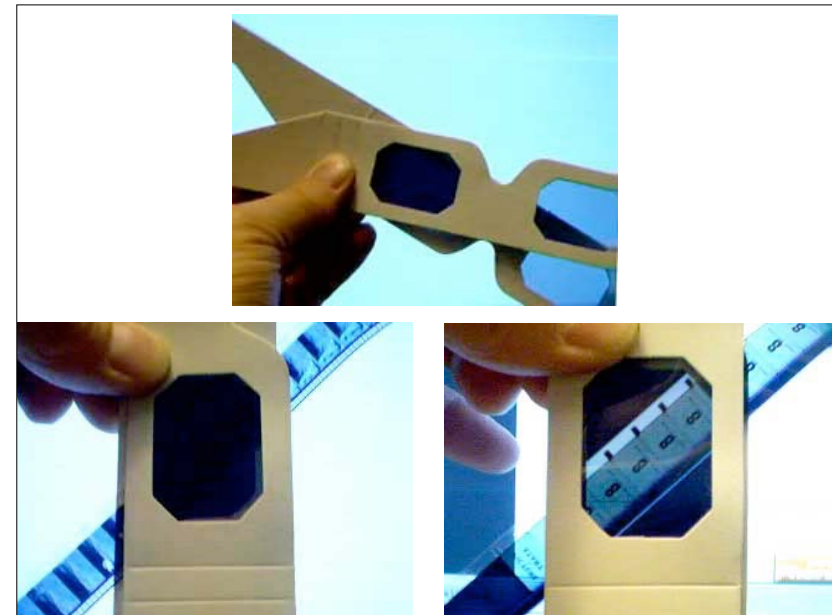
disadvantages

- static charge attracts dust
- can only be spliced ultrasonically
- is also affected by hydrolysis

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base	since	main uses (Kodak)
Nitrate	1869	for still and cinefilm from 1888 until 1951
Diacetate	1909	<ul style="list-style-type: none"> • from 1915 until 1937 for home cinema distribution of cinema classics • from 1923 until 1948 for amateur films
Triacetate	1936	<ul style="list-style-type: none"> • since 1948 for film und magnetic tape • replaced nitrate in 1951 for projection prints • still used today in most camera negatives
Polyester	1940s	<ul style="list-style-type: none"> • since 1955 for magnetic tape • occasionally for Super 8 (Fuji) • 1990s for 35 and 16mm prints and duplicates

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Bibliography

The Film Preservation Guide. The Basics for Archives, Libraries and Museums. National Film Preservation Foundation, San Francisco CA 2004

www.filmpreservation.org

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