

1 What is Micro Film?

1 ● Forms of Micro Film

a. Classification by Different Forms



b. Negative and Positive of Images

* Roll films are either 35mm or 16mm. Besides, there are films of such forms as Film Jacket and Micro Card.

c. Classification by Different Bases

Nitrocellulose (NC) Base	Flammable (ignitable) film, which had been used before 1955 in Japan.	 NC Base
Triacetyl Cellulose (TAC) Base	Under environment with the average temperature and humidity, deterioration called Vinegar Syndrome would be developed in about 30 years.	
Polyethylene Terephthalate (PET) Base	A base that is physically more stabilized. In Japan, TAC base had been replaced by PET base since early 1990's.	

2 ● Understanding the Current Conditions of Films in Collection

a. What are the Contents?

- In case of original films, their original texts might already have been lost and their contents could be extremely rare.
- If reprinted versions or digital data already exist, they might not be that rare. Concerning films with severe deterioration, disposal could be an option.

b. What are the Materials?

- Old films (dating back before 1950's) could be NC base and they are flammable (ignitable), therefore, consult a specialist immediately to avoid a risky situation.
- TAC films could possibly have developed the Vinegar Syndrome. Try to address them quickly.
⇒ Refer to "3"

3 ● Comparison of Features; Analogue Media(Micro Materials) and Digital Media

Analog Media▶Media ensuring "long storage life and safety" for the future.

System-Independent	Self-Contained	Compatibility Oriented	Long Storage Life
--------------------	----------------	------------------------	-------------------

Digital Media▶Media involving more "uncertainties, risks, and costs" with the passage of time.

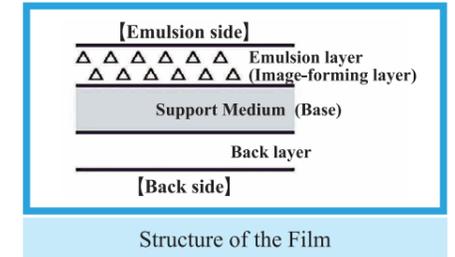
System-Dependent	Security Measures	Convenience Oriented	Management Cost (such as migration)
------------------	-------------------	----------------------	-------------------------------------

2 Proper Preservation Methods and Environmental Improvements

1 ● Understanding Basic Data : Generation, Base, Image-forming Methods

a. Generation

	Negative, Positive	Forward and reverse viewed from the emulsion side	Emulsion side of the film viewed from the center of the reel
First Generation	Negative	Mirror Image	Outside
Second Generation	Negative or Positive	Normal Image	Inside
Third Generation	Negative or Positive	Mirror Image	Outside

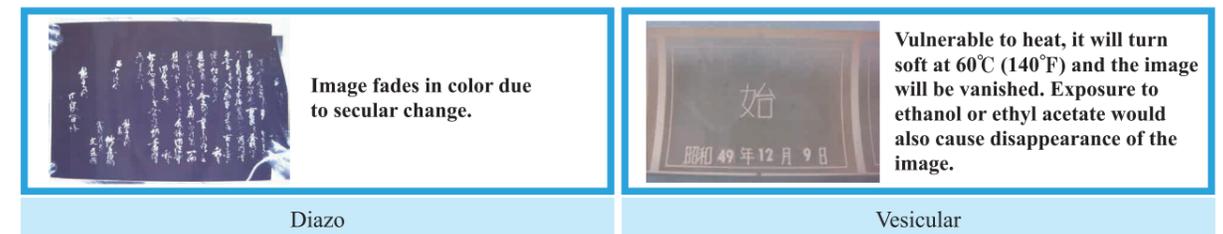


b. How to Identify the Base Material (TAC/ PET)

- ① Destructive Procedure: TAC is easy to be ripped, while PET cannot be torn by hands.
- ② Non-Destructive Procedure: A method utilizing polarized nature of PET (Recommended).



c. Films Unsuitable for the Long-term Preservation or Replication (Durability of Images: about a few decades)



IMPORTANT Films of different generations, bases, and image-forming methods should be kept separately as much as possible.

2 ● Environmental Improvements

a. Temperature and Humidity Control

- Concerning preservation of TAC films, try to maintain environment below 40%RH. It is better to have lower humidity, keep it below 21°C (69.8°F), if possible. (The International standards of temperature and humidity for preserving film materials are; ISO 18901:2010)
- It is indispensable to monitor and keep records of temperature and humidity.

b. Thermal Insulation of Facility / Resolving Temperature Unevenness



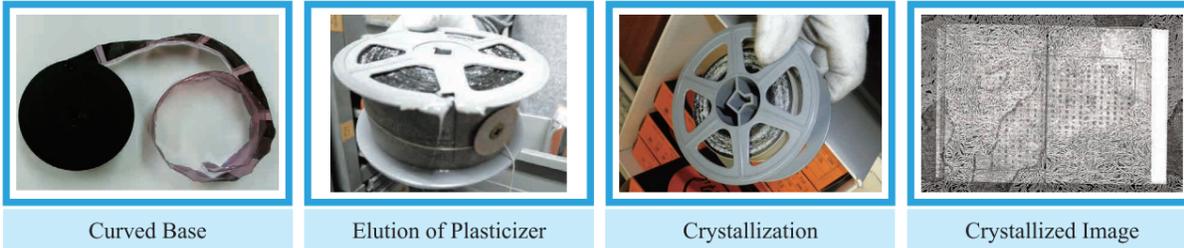
c. Replacing Packing Materials



3 Handling Abnormal Changes (Fractures in Films, Acetic Acid Odor etc.)

1 Varieties of Deteriorations

a. Vinegar Syndrome (Mind the impact not only on films but also on human body and facility)



Duration of TAC films and their relevance to Temperature and Humidity (Closed Space)

24°C (75.2°F) • 50%RH	about 30years
30°C (86°F) • 50%RH	about 15~20years
35°C (95°F) • 70%RH	about 6~7years

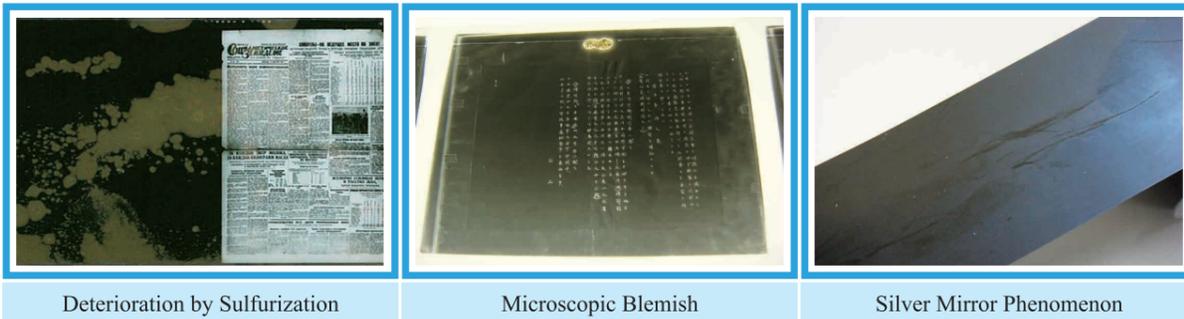
Comparison of Acetic Acid Concentration (1ppm=0.0001%)

Harmless level to cultural resources	0.17ppm (170ppb)
Space where acetic acid odor can be detected by human	over 1ppm
Tolerable level for human body	10ppm
Films of A-D Strips Measure Level over 3	40~50ppm

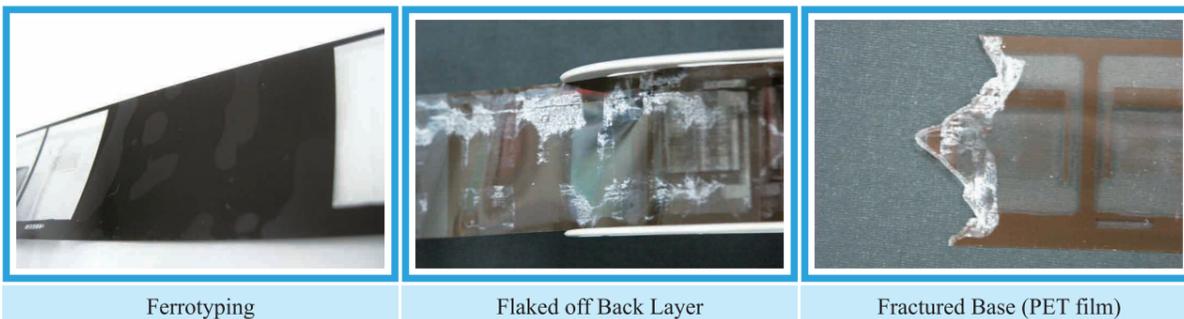


Deterioration inside Air-conditioning Equipment

b. Change of Color and Discoloration (Sulfurization • Oxidization)



c. Deterioration Caused by Improper Temperature and Humidity



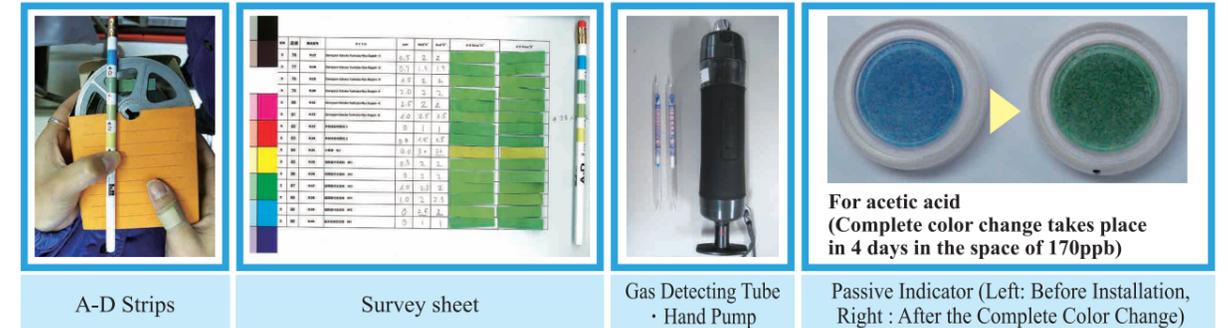
* Besides, high humidity could cause biogenic damages such as fungus, while low humidity could result in cracks in images.

2 Identifying Deteriorated Films

a. Sampling Survey and Complete Survey

- Sampling Survey (Generally, sampling 400 items at random)
 - Assessment of the overall deterioration state from comprehensive perspective.
- Complete Survey → Identification of deteriorated parts from micro level perspective.

b. Tools for Survey



For acetic acid (Complete color change takes place in 4 days in the space of 170ppb)

3 Plans for Measures against Deterioration

a. Improving Environmental Conditions



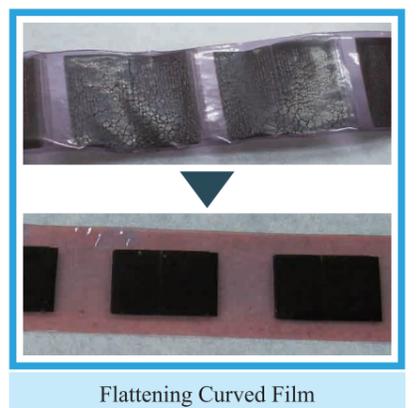
Efficient means to slow down the deterioration of TAC films

- ① **Zoning** : Depository should be established in a comparted place with low temperature, easy to be backed up by thermal insulation.
- ② **Environmental Management** : Minimize the influx of outer air, enhance airtightness and keep thorough dehumidification.
- ③ **Isolation** : If films are in great quantity, control the whole space of depository. In case they are small in amount, it would be more economical to enclose them in a small space.
- ④ **Removing Acetic Acid** : Acetic acid should be removed by placing adsorbent close to the emission source. Replace the adsorbing filters properly, while monitoring the aerial density of acetic acid.

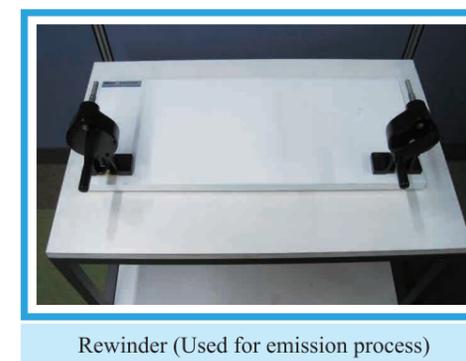
b. Treatments for Individual Films

Different adsorptive capacities of adsorbents

Adsorbent	Against Acetic Acid	Against Nitrogen Oxide
Activated Carbon	Moderate	Weak
Molecular Sieve (Zeolite)	Moderate	Weak
Silica Gel	Good	Weak



Flattening Curved Film



Rewinder (Used for emission process)

Guide to Micro Film Preservation for Libraries, Museums and Archives by Team for Basic Research on Preservation of Microfilm Materials as Cultural Heritage

Copyright©2015
 English edition published by Team for Basic Research on the Preservation of Library Collections
 Contact : The Resources and Historical Collections Office, The Library of Economics, The University of Tokyo
 e-mail shiryo@e.u-tokyo.ac.jp

This leaflet is one of the outcomes of the research; JSPS KAKENHI (Grants-in-Aid for Scientific Research B) 15H02786.