

Framing, storage, and labeling materials can introduce a variety of reactants, which act upon different layers of a photograph producing diverse types of damage. Separate tests are necessary to detect all of these reactants. The diagram below, a general cross-section of a photograph (image material, binder, support), outlines which layers are affected by certain reactants.

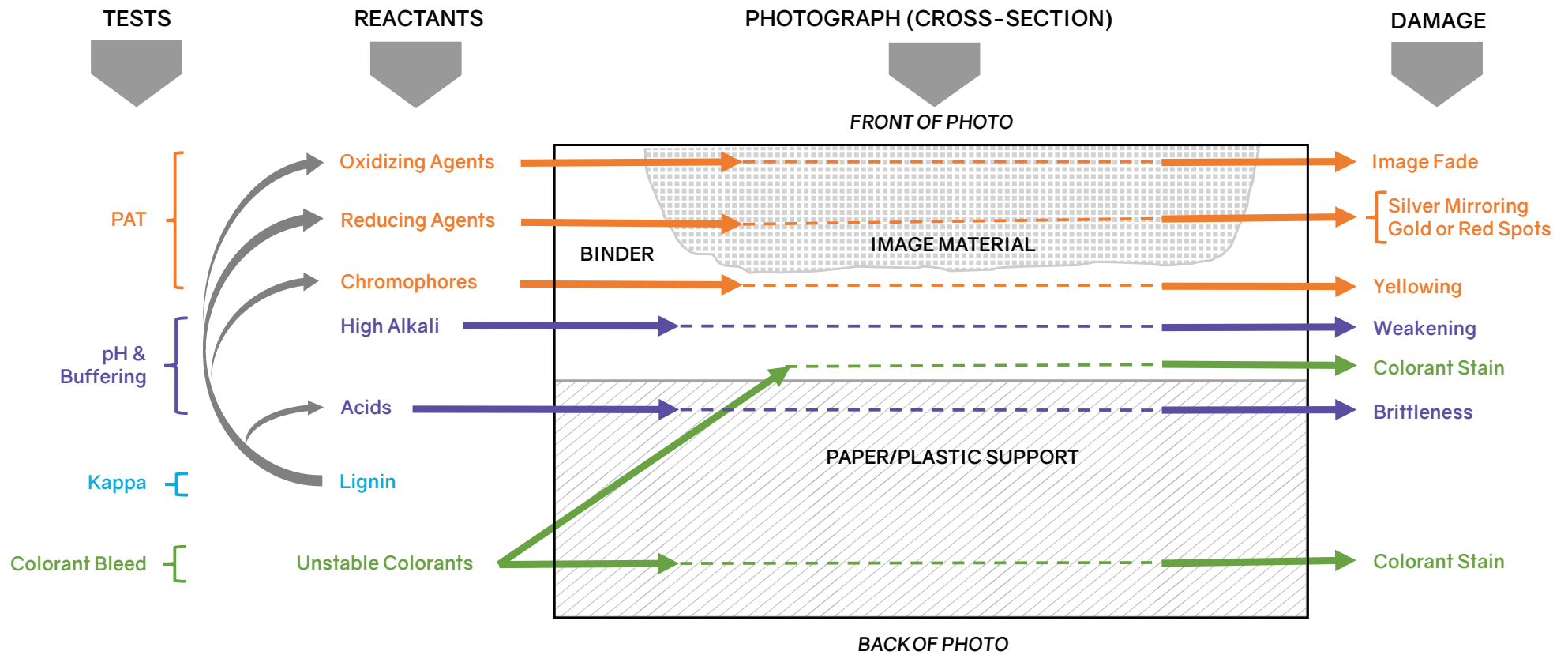
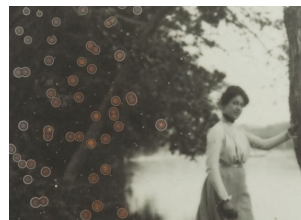


Image fade caused by adhesive



Silver mirroring caused by oval window mat



Red spots in shadows



Yellowing caused by envelope adhesive



Embrittlement caused by acids



Stain caused by dye in paper stored in contact with the photo

## INTRODUCTION

The purpose of this guide is to help users select chemically inert photo-storage, display, and labeling materials in accordance with the International Standard ISO 18902 *Imaging materials – Processed imaging materials – Albums, framing and storage materials*. **Photo-safe** is the term used by the standard to define and specify materials that will not induce chemical damage in photographs over time. It includes all photographic objects made by the following processes:

- Silver Gelatin
- Chromogenic
- Silver Dye Bleach
- Dye- and Pigment-based Inkjet
- Dye Diffusion Thermal Transfer (Dye Sublimation)
- Liquid- and Dry-toner Electrophotography

Materials that are not photo-safe can cause or accelerate the occurrence of fading, yellowing, silver mirroring, or brittleness among other types of chemical damage.

This side of the guide has a description of the standard's requirements. The opposite side of this guide illustrates which elements of a photograph are most likely affected by harmful components (reactants) in photo storage, display, and labeling materials. Photographs should be housed only with materials that are photo-safe.

ISO 18902 describes all the tests and additional requirements with which the different components of a photo-storage, display, or labeling material must comply in order to be deemed photo-safe (see table). As the table indicates, each type of material must meet a different set of tests and requirements. Only materials that meet all specifications of this International Standard can be considered photo-safe. Materials that pass only the pH requirements or only the PAT are not necessarily photo-safe.

It must be noted that the standard's definition of photo-safe refers only to the chemical reactivity of a material and does not imply that the material will not interact physically with a photograph causing damage such as abrasion, creases, or tears.

You can access the standard at [www.iso.org](http://www.iso.org). IPI provides testing services for all photo-safe required testing. More information on IPI testing services can be found at [www.imagepermanenceminstitute.org](http://www.imagepermanenceminstitute.org).

## TESTING REQUIREMENTS

### PHOTOGRAPHIC ACTIVITY TEST (PAT) (all materials)

The Photographic Activity Test, widely known as the PAT, is an International Standard in itself: ISO 18916. The PAT explores the possibility of chemical interactions between photographs and a given material after prolonged contact. It uses two special detectors. One detector screens for **oxidation** and **reduction** reactions which can cause image fade, silver mirroring, and red or gold spots. The other detector, screens for **chromophores** – compounds that can cause yellowing of the support. All materials must pass the PAT to be considered photo-safe.

### ACID-FREE (paper and adhesives)

The acidity of a material is described by its pH value. The pH scale ranges from 0 to 14, where 7 is neutral, below 7 is acidic, and above 7 is alkaline. **Acidic** environments can accelerate the degradation of paper and plastic supports making them brittle. **Highly alkaline** environments, on the other hand, can also cause decay, such as weakening of a gelatin binder. Therefore, an upper pH limit is just as important as a lower pH limit, so the standard incorporates an upper pH limit of 10. To be considered photo-safe, paper-based materials and adhesives must have a pH equal to or greater than the reference water used in testing and less than 10 when measured by a cold extraction pH method.

### ALKALI RESERVE (BUFFERING) (paper)

Paper-based materials must include an **alkali reserve** of at least 2% calcium carbonate (CaCO<sub>3</sub>). The alkali reserve has the ability to capture acids that may be in the air, the photograph, or in the material itself. Its useful life, however, is limited since it is consumed as it reacts with acid.

### LIGNIN-FREE (paper)

Lignin is abundant in unpurified wood-pulp paper and is known to generate oxidizers, reducers, acids, and chromophores over time. As a

result, photographs kept with materials that contain high levels of **lignin** may undergo silver image deterioration and yellowing. *Kappa number* is a measure of the lignin content of paper. The more purified a paper is, the less lignin it contains and the lower its Kappa number will be. In order to be considered *lignin-free*, papers and paper boards must have a Kappa number of 7 or below (equivalent to a lignin concentration of 1% or less).

### COLORANT BLEED (colored paper and labeling materials)

The dyes or pigments used to color paper materials, as well as those used for labeling, must pass the colorant bleed test. This test assesses the risk of colorant bleed, transfer, or spread when the material is soaked in water. Colored materials that fail this test have the potential to bleed onto adjacent photographs and are, therefore, not photo-safe. These **unstable colorants** can affect the front or the reverse of a photograph.

### ADDITIONAL REQUIREMENTS

ISO 18902 includes other requirements as well as recommendations depending on the material type (see table and refer to the standard for a comprehensive list of requirements to meet photo-safe designation).

ISO 18902 REQUIREMENTS BY MATERIAL TYPE						
	PAT	Kappa	pH	Alkali Reserve	Colorant Bleed	Examples of additional requirements (see standard for full details)
Paper	✓	✓	✓	✓	✓	-No post-consumer recycled paper. -If sizing is used, neutral or alkaline sizing chemicals shall be employed.
Plastic	✓					-No plasticizers. -No chlorinated, nitrate, or acetate plastic. -Fire-retardant plastics used for containers shall contain antioxidants and non-halogenated fire retardants, such as antimony oxide.
Adhesive	✓		✓			-No rubber-based adhesive. -Water-based adhesives should not be used directly on dye inkjet photographs as they may induce color bleeding of the image.
Metal	✓					-Shall be non-corrosive. -No lacquer and enamel that gives off reactive fumes, peroxides, or exudations.
Labeling Materials	✓				✓	-The ink in all writing instruments shall comply with the performance requirement for strike-through and with the requirements for water resistance and light resistance.
Glazing	✓					-All framed photographs shall be displayed behind glass or plastic glazing with optical density of at least 1.5 in the 300- to 380-nanometer range. -Photographs should not be framed in direct contact with glazing.
Frames	✓					-Plastic or metal frames that meet ISO 18902 should be used. -Other materials (such as wood) may be used, however; their effects over time on framed photographs will be unknown, so the framing package (glazing, mat, and backing board) shall be sealed along the edges with aluminized polyester tape (or other impermeable barrier) that meets ISO 18902 to minimize or prevent potential harm.