
Imaging materials — Evaluation of image permanence of photographic colour prints in consumer home applications

*Support d'image — Évaluation de la permanence de l'image de
tirages couleur photographiques dans les applications domestiques
grand public*

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Published in Switzerland

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Foreword

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This document was prepared by Technical Committee ISO/TC 42, *Photography*.

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Introduction

Reflection colour photographic-indoor stability specifications for consumer home have been discussed (Physical properties and image permanence of photographic materials). Many matters have been discussed about environmental data, psychophysically based end of test, nominal use case conditions, and mechanics of rating system, reciprocity issues, and experimental testing issues in the meetings.

This document describes cumulated information, data and knowledge work over the last 15 years as 'Guidelines for print-life-estimations'. Furthermore, it describes the background and the history of the discussion in TC 42/WG 5.

The purpose of this document provides data, information, and indicating the guidelines for evaluation of image permanence. These data and information were introduced and discussed and were quoted from the papers reported in conferences by TC 42/WG 5 members. Furthermore, detailed information and understanding are available in the references listed in the Bibliography in this paper.

It describes four important environmental stressors (heat, light, atmospheric pollutants, and humidity) in main body of this document. Ozone was chosen as the model system for atmospheric pollutant, but SO_x, NO_x and other atmospheric pollutants are present in the indoor environment. In addition, it includes an [Annex A](#) about accidental stressor (water, abrasion and others), examples of many topics and useful data collections and information.

Information about the stability of colour photographs toward these various factors can be obtained by accelerated stability tests. The starting assumption for indoor use cases is that the various environmental factors (heat, light, atmospheric pollutants, and humidity) each act independently on the photograph, i.e., there are no synergistic interactions taking place between these factors under typical storage and display conditions. While interactions most certainly do take place in the real world, modelling and testing for interactions is extremely difficult. The accelerated tests are therefore designed such that only one factor (heat, light, atmospheric pollutants and humidity) is varied at a time. The other factors not under investigation are controlled or held at a level that will induce only negligible changes in the image during the course of the accelerated test.

In accelerated testing, high levels or "loads" are required for each of the factors in test in order to complete the tests in a reasonable amount of time. The validity of accelerated testing for light and pollutants assumes that equal change will occur for the same cumulative exposure, i.e., one assumes reciprocity for the dose. However, for some systems "reciprocity failure" has been observed. When applied to light-induced fading and staining of colour images, reciprocity failure refers to the failure of many colorants to fade, or to form stain, equally when irradiated with high-intensity versus low-intensity light, even though the total light exposure (intensity × time) is kept constant through appropriate adjustments in exposure duration. This concept can be applied to any accelerated test where the same cumulative exposure can be obtained by different intensities or concentrations and time. Note, however, that this concept cannot be applied to accelerate testing for heat or humidity where special test procedures are required. This concept does hold for ozone stability testing, where the ozone concentration can be high or low. The extent of colorant fading, colorant migration, and stain formation can be greater or smaller under accelerated conditions, depending on the chemical reactions involved in the colorant degradation, on the kind of colorant dispersion, on the nature of the binder material, and on other variables. For example, the supply of oxygen that can diffuse into a photograph's image-containing layers from the surrounding atmosphere may be restricted in an accelerated test (dry gelatine, for example, is an oxygen barrier). This may change the rate of colorant fading relative to the fading that would occur under normal display conditions. The magnitude of reciprocity failure may also be influenced by the temperature and moisture content of the test specimen. Comparisons between products will more accurately reflect observed differences when accelerated aging conditions are close to actual use conditions.

The following International Standards describe test methods relating to indoor stability. These Standards provide procedures for reporting technical data.

A test method for thermal stability is described in ISO 18936. A test method for humidity fastness is described in ISO 18946. A test method for indoor light stability is described in ISO 18937. A test method

for ozone gas fading stability is described in ISO 18941. A test method for stability under low humidity conditions in ISO 18949.

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