

# Spectrophotometric Data Analysis to Investigate the Photodegradation of Photochromic Prints Exposed to Continuous UV Irradiance

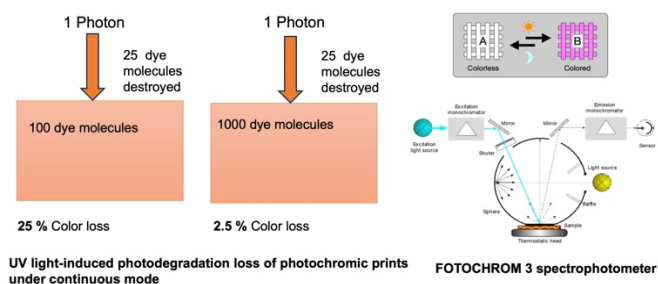
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**Abstract:** When studying photochromic materials, it is crucial to consider qualities like photostability and durability. Fatigue resistance in a photochromic system is the loss of reversible processes such as photodegradation, photobleaching, and photooxidation. Photochromic compounds undergo reversible colour changes when exposed to external stimuli like UV radiation. The photodegradation behaviour of photochromic dye was studied thus preparing the photochromic prints using the screen-printing process, with various concentrations of photochromic dye, and their photo-fatigue behaviour under cyclic continuous UV irradiance mode has been studied using a FOTOCHROM 3 spectrophotometer. The fatigue resistance of these photochromic prints was assessed by measuring their colour change using a Kubelka-Munk function from the obtained reflectance data using a FOTOCHROM3 spectrophotometer during a photo-fatigue scenario involving a photochromic cycle's growth and bleaching phases. UV irradiation causes the degradation of the photochromic dye molecules in these prints. The empirical data collected and analysed to examine the photodegradation behaviour of prints shows a stepwise regression model using the intermediate cyclic measurement method. Alternatively, the long-continuous measurement method shows a one-phase dissociation model. The fading percentages for different measurement modes are as follows: intermediate cyclic mode with relaxation phase: 31.56%; extended continuous mode with relaxation phase: 20.95%; and extended cyclic continuous mode without relaxation phase: 10%.

**KEYWORDS:** Photochromism, fatigue resistance, photochromic pigment, UV irradiance, colour intensity values.



**Figure 1** General schematic of photodegradation theory model and FOTOCHROM 3 device

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