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# Photobleaching for Objet VeroClear (FullCure®810)

## Purpose

This document describes post-treatment methods for models printed with Objet VeroClear on Objet 3-D printers. Models made with Objet VeroClear have a slight yellow tint when removed from the printer. Models printed with a glossy finish have a stronger tint than those printed with a matte finish, due to the longer UV exposure.
This yellow tint fades naturally over time, with all models, regardless of printing mode. You can greatly accelerate this process by using a suitable photobleaching treatment.

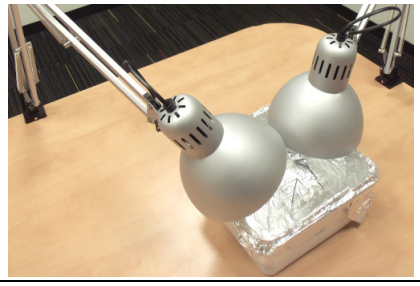
**Note:** Final clarity depends on the model geometry.

## Overview

The most significant reduction of yellowing was obtained by exposing models to fluorescent lighting while heating to 40ºC for a six-hour period.

## Suggested Methods

The following table provides two methods for performing the photobleaching process on printed models.

| | Description | Image | Cost |
|---|---|---|---|
| **Method A:** Illumination Chamber | • Off-the-shelf chamber<br>• Enables controlling temperature and light intensity<br>• Assures predictable results |  | Approx. $1,300 |
| **Method B:** Table lamps | • Self-assembled from readily available components<br>• Low cost solution<br>• Varying results, due to the lack of precise control over temperature and light intensity |  | Approx. $50-200, depending on the number of lamps used |

# Effects of Photobleaching

Photobleaching reduces the yellow tint in models printed using VeroClear. The greatest improvement—approximately 70% reduction—occurs within six hours of treatment. After 24 hours, approximately 90% reduction was obtained. Continuing the treatment for more than 24 hours showed only minor additional improvement.

Figure 1 shows the reduction of yellow tint in glossy models when using the methods described above, and without treatment.

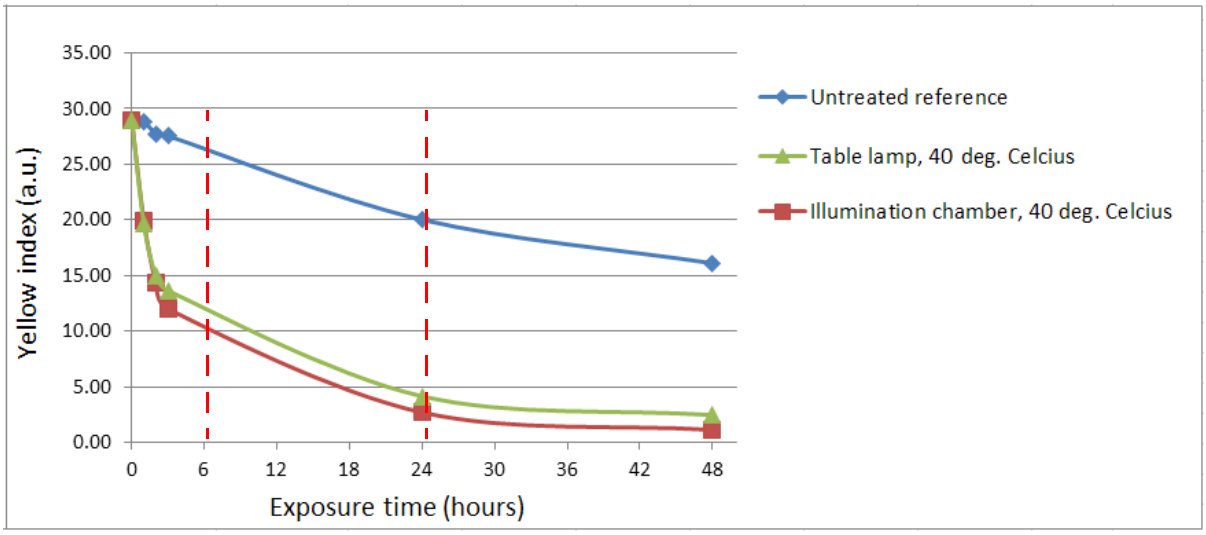



**Figure 1:** Comparison of photobleaching methods in glossy models

Figure 2 shows the reduction of yellow tint in models printed in High Speed and High Quality print modes, when using the illuminated chamber (Method A above).

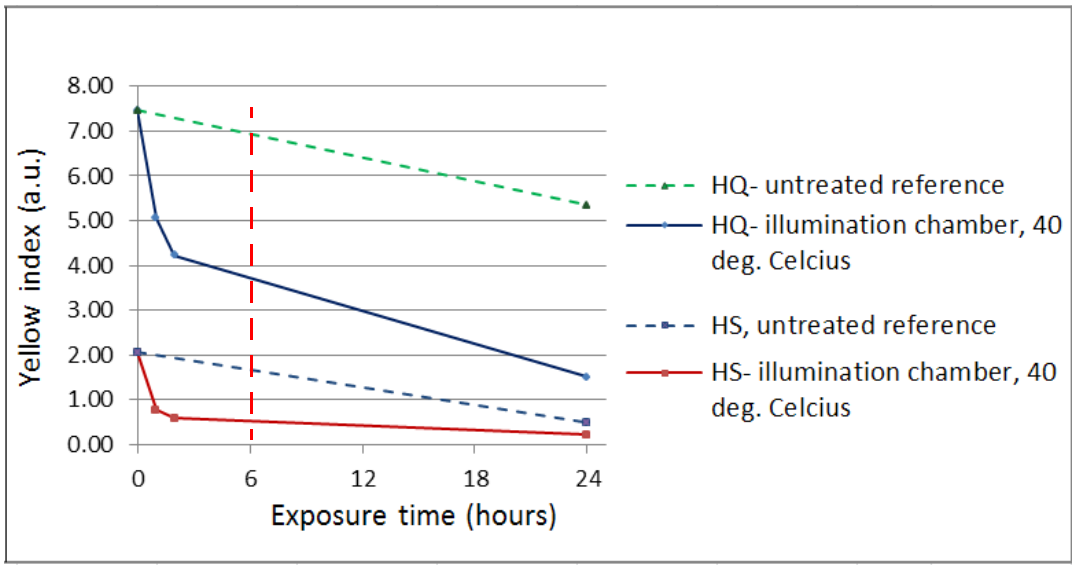



**Figure 2:** Comparison of initial yellow tint and its reduction, using photobleaching methods, on models printed with different print modes

# Performing Photobleaching on Printed Models

Both methods A and B are suitable for all model geometries.

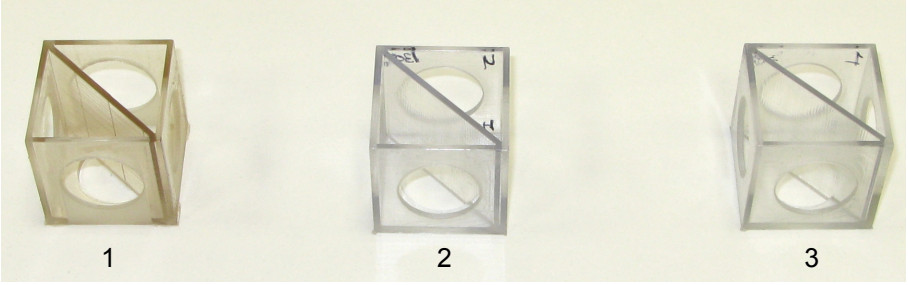



**Figure 3:** Sample model before treatment (1); after photobleaching in chamber (2); and after photobleaching with table lamps (3)

## Method A - Illumination Chamber

**Note:** Verify that the fluorescent lamps in the chamber are 45W, 6500K.
See "Specifications for Recommended Illumination Chamber" on page 4 for the recommended type of illumination chamber to use.

1. Arrange the printed models in the chamber with enough distance between them to allow light to reach all sides of each model.
2. Turn on the lights in the chamber, and leave the models for at least six hours.

> **Caution:** Verify that the model temperature does not exceed 40°C (104°F). Higher temperatures may cause model distortion, whereas less than 40°C (104°F) may not produce satisfactory results.

3. After 6 hours, inspect the models. If the results are still not satisfactory, leave the models in the chamber for up to 18 hours more.

## Method B - Table Lamps

1. Cover the inside of a container with aluminum foil.
2. Arrange the printed models in the container with enough distance between them to allow light to reach all sides of each model.
3. Prepare two table lamps with 45W, 6500K fluorescent lamps.
4. Position the lamps on the table, approximately 10 cm (4 in.) above the models.
This distance prevents the lamps from warming the models above 40°C.

**Note:** When using large containers, use additional table lamps.
Do not place the lamps closer than 10cm (4in.), as the heat from the lamps may affect the dimensional stability of the models.

> **Caution:** Verify that the model temperature does not exceed 40°C (104°F). Higher temperatures may cause model distortion, whereas less than 40°C (104°F) may not produce satisfactory results.

5. After 6 hours, inspect the models. If the results are still not satisfactory, leave the models in the chamber for up to 18 hours more.

# Specifications for Recommended Illumination Chamber

The following are the specifications for the recommended illumination chamber.

| Description | Specification |
|---|---|
| Illumination chamber | Qingdao COMBI, model GZX150 |
| Humidity control | N/A |
| Capacity | 150 liters |
| Input power | 760W, 220V, 50Hz |
| Temperature variation | • With illumination: 10-50°C<br>• Without illumination: 4-50°C |
| Temperature fluctuation | ±1.0°C |
| Temperature distinguishability | 0.1°C |
| Temperature uniformity | ±1.5°C |
| Ambient temperature | 5-35°C |
| Refrigerant | R134a |
| Illumination intensity (LX) | 4 grade adjustment, between 0-12,000 LX |
| Continuous working time | No less than 180 hours |
| Interior dimensions (mm) | 550 x 400 x 550 |
| Exterior dimensions (mm) | 650 x 800 x 1,310 |
| Number of shelves | 3 |

If you have any questions about the procedure in this document, contact your local Objet specialist.