

Heat Stability = Color change, True or False?

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Abstract

In DIN EN 12877, part 1 to 4 - Determination of color stability to heat during processing of coloring materials in plastics, standardized methods are described to quantify the degree of stability dependent on processing temperature.

The phrase “heat stability” of the pigment is commonly used, however the cause of the color change is often something very different.

The performance of pigments, when processed into polymers, depends on several factors, including the type of pigment and resin being used, additives, as well as the temperature, time, and associated shear during processing.

In general, pigments and resins are selected based on their ability to withstand the temperature and processing conditions during processing.

Dependent on pigmentation level, resin type, temperature, processing conditions etc., a color change may occur which is usually attributed to the heat stability of the pigment itself.

This paper aims to explore the numerous causes of color change and to show that they are often not directly attributable to the thermal stability of the pigment itself, but in fact are the result of a reaction between multiple components and the processing / environment.

In some cases, the color change is the result of the polymer failing rather than the pigment.

For example, a pigment can dissolve (partly) in the resin at elevated temperatures resulting in a color shift, thereby showing all the negative properties known from a dye.

Understanding of the exact mechanisms which cause the color change allows the change to be addressed by coating the pigment or by more creative formulating / processing to limit, or even prevent, interaction and therefore extend the potential applications.