

SURFACE TEMPERATURES OF COLOR PAINTED SAMPLES IN NATURAL AND ARTIFICIAL WEATHERING WITH DIFFERENT LABORATORY LIGHT SOURCES FOR OPTIMIZED TESTING AND INVESTIGATIONS

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Abstract

The most significant weather factors affecting natural and artificial weathering are solar radiation, heat, water (moisture, dew and rain), as well as air-borne pollutants. The influence factor, heat, is characterized by the surface temperature of the sample. Depending on the specific solar reflectance of the material in the visible and infrared ranges primarily, radiation striking the surface heats it up by far above the temperature of the surrounding air.

Surface temperatures of two sets of colored (black, green, blue, red, orange, yellow, white) samples with different solar reflectance in the infrared range measured under typical exterior exposure conditions (Central Arizona and South Florida) and in a range of weathering instruments using different laboratory light sources (xenon, metal halide, fluorescent).

Diurnal outdoor temperatures (sunrise to sunset) are compared to the temperatures measured in weathering instruments with artificial laboratory light sources. This enabled to rank the laboratory light sources by their ability to match as closely as possible the temperature differences obtained outdoors.

The measured exterior data are used to derive a simple model to estimate the surface temperature of colored thick polymeric specimens under natural exposure.

The data and the theoretical model can be used as a basis to develop artificial weathering tests with improved temperature conditions. This could be used for a better estimation of service life of colored materials.