

# Calibration of Filter Radiometers for Weathering and Photostability Tests

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## Abstract

The examination of the aging behavior of polymer materials and photostability examinations under the influence of sunlight or general weathering influences are also carried out in weathering devices.

With regard to the appearance of signs of aging, it is generally exposure to radiation which is seen as the primary cause of aging. In these cases, sunlight must be reproduced as realistically as possible by the equipment. The spectral distribution as well as the irradiance of sunlight on the earth's surface are dependent on the location as well as on the time of day and the time of year. The spectral distribution specified in CIE publication No. 85, Table 4, today serves as the reference spectrum for global radiation throughout the world. These requirements can be particularly well met by the spectral continuum provided by xenon radiation in conjunction with special filters in the UV range (photochemistry) and the IR range (thermal effect) for adjustment to various test conditions. A specific radiation function has been defined for global irradiation behind window glass, and this can also be reproduced very well through the employment of xenon radiation with corresponding filtration.

The level of irradiance at the exposure level has also been defined in test standards for the UV and visible ranges which are of such importance to photochemical processes.

In the test equipment itself, the irradiance within the wavelength range required for testing can be adjusted at the sample level within predefined tolerances.

Standardization requires the measurement of the irradiance primarily in the UV range which is important for photochemical processes.

Various filter radiometers have been developed to provide constant regulation as well as to test the irradiance at various wavelengths in the UV range as well as in the visible wavelength range at the sample level.

In the following, the filter radiometers employed in weathering equipment are introduced (relative spectral sensitivity, measuring range, stability, proper cosine evaluation). An extremely stable xenon lamp unit has been developed for the calibration of filter radiometers. The extensive calibration of these radiometers – starting from the national standard and going down to the radiometer's application in the weathering device – are also discussed.