WEATHERING TEST METHOD AND SAMPLE HOLDER USED THEREIN

This invention relates to a weathering, or weather-fastness, test method carried out under predetermined conditions, e.g. exposing a sample to light, to air having a temperature and humidity of predetermined levels, and to rain, and while the sample is under tension, compressive force and/or bending stress is repeatedly imparted thereto; and to a sample holder used in such a method.

BACKGROUND OF THE INVENTION

The weathering tests which have heretofore generally been conducted include such tests known as an accelerated weather-fastness test, which is a test carried out in a laboratory under predetermined conditions, e.g. exposing a sample, placed in an enclosure similar to the environment in which it is to be used, to the radiation of light, to air having a temperature and humidity of predetermined levels, and to rain in an accelerated weather-fastness testing machine such as is shown in FIG. **4**, and atmospheric exposure tests carried out by placing a sample directly in a natural outdoor environment.

The accelerated weather-fastness testing machine **11** shown in FIG. **4** is used in a weather-fastness test conducted by placing a light source **13** in the central portion of a test chamber **12**, attaching a sample **15** to a holder **16** (for example, the holder shown in FIG. **5A**) in an unstressed state, i.e. without any tension, compressive force or bending stress applied thereto, and having the holder **6** on a sample frame **14** adapted to be rotated around the light source **13**.

A weather-fastness test method as disclosed in Japanese Patent Laid-Open Application No. 35346/1989, is carried out by using a holder **17** as shown in FIG. **5B**, by which stress (e.g. tensile stress) of a predetermined level is constantly and positively imparted to a sample **15**. The outdoor exposure test methods shown and described, for example, in JIS D 0205, include a method carried out on a rubber-like sample exposed as it is, and a method carried out by using a rubber-like sample bent in a looped state under bending stress of a predetermined level constantly and positively imparted thereto.

These weather-fastness tests which have heretofore generally been conducted are carried out with a sample in a static state, i.e. in a state in which stress is not imparted to the sample, or in a dynamic state in which stress of a predetermined level is constantly imparted to the sample.

A weather-fastness test method requires that: (1) the deteriorated condition of a sample have some correlation with the deteriorated condition which would be seen if the sample were subjected to exposure in its intended condition of use, i.e. outdoors; (2) the method be highly accelerated in comparison with an atmospheric exposure test method which places the sample in its intended condition of use; and (3) the tests conducted be repeatedly under the same conditions and be reproducible.

Many materials and products in practical use are under tensile stress, compressive stress and/or bending stress at all times. Since the force generating such stress generally varies with temperature, the level of stress imparted to the materials and products is not always constant, but rather it varies as the temperature varies. For example, the temperature of a material used as an interior facing material for an automobile varies repeatedly in accordance with the variation of the outdoor temperature. Since the temperature inside an automobile due to the outdoor temperature can increase as much as 100° C. in the daytime and drop to 20° C. in the nighttime, the level of stress imparted to the material also varies.

However, a conventional weather-fastness test method, which is used to test a sample in a static or dynamic state as described previously, does not test a sample by reproducing the repetition of variation of the stress generation force imparted to the materials and products to which they are subjected during their intended use.

Therefore, in a test using an accelerated weather-fastness test method, the deteriorated condition of a sample placed in its intended condition of use may not be accurately reproduced, so that the deteriorated condition of a sample tested in such a machine may have little correlation with that of a sample placed in its intended condition of use. Since the variation of stress is taken into consideration in any test conducted under actual conditions of use, it is necessary that a material or product to be placed in practical use be tested under the conditions of such use in any testing method. This requires a large space for carrying out such tests, and the expenditure of a lot of money.

OBJECT AND BRIEF SUMMARY OF THE INVENTION

There has therefore been a strong demand for a test method capable of solving these problems, and it is an object of the present invention to provide such a method and a sample holder used in this method.

To this end, the present invention provides a weather-fastness test method utilizing a novel sample holder and comprising the steps of fixing the sample to the holder which is provided with metal coils the shape of which varies in accordance with the variation in the temperature of the ambient air and the radiation heat from a light source and which are connected so as to apply a force to the sample as the temperature changes, placing the sample under predetermined conditions, e.g. exposing the sample to radiation by light, to air having a temperature and humidity of predetermined levels, and to rain, while the sample is under repeated tension, compressive force and/or bending stress due to the variation of the shape of the coils and imparted to the sample, and then evaluating the weather-fastness resistance of the sample.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described in greater detail in connection with the accompanying drawings, in which:

FIG. **1***a* is a front elevation view of a sample holder used in the present invention and adapted to impart tensile stress to a sample and showing the holder with a sample in an unstressed state;

FIG. **1***b* is a similar view of the holder of FIG. **1***a* with the sample under tensile stress;

FIG. **2***a* is a front elevation view of a sample holder used for imparting compressive stress to a sample and showing the holder with the sample in an unstressed state;

FIG. **2***b* is a similar view of the holder of FIG. **2***a* with the sample under compressive stress;