reflective radiation diffusing material, either in the form of a coating or a monolithic wall material. When radiation is introduced into the interior of the sphere, the radiation is reflected off of the inner surface in all directions. After many reflections and re-reflections, the radiation flux within the sphere will be spatially integrated in a uniform distribution in all dimensions. A beam of radiation exiting an aperture in the integrating sphere will have a uniform radiance over the width, and preferably over the area, of the beam. Moreover, if plural apertures are provided in the integrating sphere, the radiance of each beam exiting the sphere will be uniform from beam to beam. These principles of integrating spheres are known, and have been described in a number of references in the art, such as Sumpner, *The Proceedings of the Physical Society of London*, 12:10 (1892) and Edwards et al., *Journal of Applied Optics*, 51:1279 (1961). Heretofore, integrating spheres have been used as sources of uniform light for measurement of the optical properties of a test specimen, as illustrated, for example, in U.S. Pat. No. 3,847,024. As is typified by this reference, the measuring apparatus includes an integrating sphere and specimen disposed within the sphere. The apparatus further includes a light source directly irradiating the specimen. A photomultiplier alternatively measures light reflected from the specimen and light reflected from a portion of the sphere. The prior art has failed to appreciate that an integrating sphere may be employed as a radiation source in an artificial weathering apparatus or method, and has further failed to appreciate that plural specimens may be simultaneously irradiated with radiation from an integrating sphere.

In accordance with the invention, a method and apparatus are provided. In one embodiment, the method comprises the steps of providing an integrating sphere and a radiation source in radiative communication with the interior of the integrating sphere, the integrating sphere having an aperture, whereby a radiation beam having a width and a substantially uniform radiance over the width of the beam is communicated from the integrating sphere. The method further includes a step of placing a specimen in radiative communication with the aperture such that at least a portion of the radiation communicated from the integrating sphere impinges on the specimen. The apparatus of the preferred embodiment comprises an integrating sphere having at least one aperture, a radiation source in radiative communication with the interior of the integrating sphere, and a specimen holder disposed externally with respect to the integrating sphere, the integrating sphere radiatively communicating with the specimen holder through the aperture. In other embodiments of the invention, a specimen is placed within the integrating sphere and is irradiated with radiation therein.

Other features and objects of the invention will be apparent from the following description of the invention and appended claims.

DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of an apparatus in accordance with the present invention.

FIG. **2** is a cut-away plan view of the integrating sphere of the apparatus shown in FIG. **1**.

FIG. **3** is a cut-away plan view of an alternative embodiment of the integrating sphere of the apparatus of the invention.

FIG. **4** is a cut-away plan view of another alternative embodiment of the integrating sphere of the apparatus of the invention.

FIG. **5** is a perspective view of one embodiment of a conduit and specimen holder assembly for an apparatus in accordance with the invention.

FIG. **6** is a side elevational view of the conduit and specimen holder assembly shown in FIG. **5**.

FIG. **7** is a perspective view of another embodiment of a conduit for an apparatus in accordance with the invention.

FIG. **8** is a cut-away side elevational view of the conduit shown in FIG. **7**.

FIG. **9** is a schematic view of one embodiment of a filter in accordance with the invention.

FIG. **10** is a perspective view of an apparatus in accordance with another embodiment of the invention.

DESCRIPTION OF THE INVENTION

The invention makes use of integrating sphere technology, which technology is based on Lambert's cosine law:

$$J_\theta = I_0 \cos\theta.$$

This law specifies that the intensity of light reflected from an ideally reflective surface is proportional to the cosine of the angle at which the light impinges on the surface. A surface is said to be Lambertian, or an ideal diffuser of light, if the intensity of the radiation reflected from that surface varies with the cosine of the angle to the surface. When the interior wall surface of a chamber is substantially Lambertian or coated to render the surface Lambertian, light will be reflected and re-reflected off of the wall surface, whereby the radiation flux within the integrating sphere will become homogenized. The homogenization of the radiation flux may be accomplished without the need for lenses and other imaging optic components.

As illustrated in FIGS. **1** through **3**, the apparatus **10** of the invention includes an integrating sphere **11** having an interior cavity **21** and an inner surface or wall **12** (shown in FIGS. **2–3**), the wall **12** having a highly reflecting Lambertian surface. The integrating sphere **11** is constructed of hemispherical halves resting on a base **113**. The wall **12** of the sphere may itself comprise a Lambertian material, such as polytetrafluoroethylene, or the wall **12** may be coated with a reflective material such as barium sulfate to provide a Lambertian surface. As light is diffusely reflected and re-reflected within the integrating sphere **11**, the radiant flux within the sphere will be homogenized, and will become highly uniform throughout the sphere **11**.

The integrating sphere **11** has an inlet aperture **13**. Preferably, the integrating sphere **11** also includes at least one exit aperture **14**, and more preferably includes additional exit apertures **15**, **16**. A beam of light exiting the integrating sphere **11** through one of the exit apertures **14**, **15**, **16** will have a width and a substantially uniform radiance over the width of the beam. Preferably, the beam will have a cross-sectional area and a substantially uniform radiance over the cross sectional area of the beam. Moreover, the radiance of plural beams existing through exit apertures **14**, **15**, **16** will be uniform from beam to beam, as well as spatially uniform over the area of each beam. Additional apertures may be provided in the integrating sphere if desired, although the total aperture area including the inlet aperture **13** preferably should not exceed about 5% of the surface area of the wall **12**.

The size of the integrating sphere preferably is chosen as is necessary for the operating conditions of the apparatus **10**. Various sizes are possible, and the integrating sphere may