Effects of increased solar ultraviolet radiation on materials. Andrady, A. L.; Hamid, S. H.; Hu, X.; Torikai, A. Research Triangle Institute, Research Triangle Park, NC, USA. Journal of Photochemistry and Photobiology, B: Biology (1998), 46(1-3), 96-103. Publisher: Elsevier Science S.A., CODEN: JPPBEG ISSN: 1011-1344. Journal; General Review written in English. CAN 130:189176 AN 1999:61878 CAPLUS (Copyright (C) 2008 ACS on SciFinder (R))

Abstract

Synthetic polymers such as plastics, as well as naturally occurring polymer materials such as wood, are extensively used in building construction and other outdoor applications where they are routinely exposed to sunlight. The UV-B content in sunlight is well known to affect adversely the mech. properties of these materials, limiting their useful life. Presently their outdoor lifetimes depend on the use of photostabilizers in the case of plastics and on protective surface coatings in the case of wood. Any increase in the solar UV-B content due to a partial ozone depletion would therefore tend to decrease the outdoor service life of these materials. It is the synergistic effect of increased UV radiation with other factors such as the temp. that would det. the extent of such redn. in service life. The increased cost assocd. with such a change would be felt unevenly across the globe. Those developing countries that depend on plastics as a prime material of construction and experience high ambient temps. are likely to be particularly affected in spite of the relatively small fractional decrease in ozone at those locations. Assessment of the damage to materials, assocd. with ozone depletion, requires a knowledge of the wavelength dependence as well as the dose-response characteristics of the polymer degrdn. processes of interest. While the recent literature includes some reliable spectral sensitivity data, little dose-response information has been reported, so it is difficult to make such assessments reliably at the present time. This is particularly true for the naturally occurring materials popularly used in construction applications. To maintain polymers at the same useful lifetime in spite of increased solar UV-B content, the amt. of photostabilizers used in the formulations might be increased. This strategy assumes that conventional stabilizers will continue to be effective with the spectrally altered UV-B-enhanced solar radiation. While the present understanding of the degrdn. chem.
suggests the strategy to have merit, its effectiveness, in an altered solar radiation environment, has not been demonstrated for common polymers. The availability of these data is crucial for reliably estg. the cost of mitigating the increased damage to materials as a result of a possible partial depletion of the ozone layer using this approach. A review with 54 refs.