Optical Characteristics of Films Produced of Ultraviolet Irradiated Polymers

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Commentary

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DESCRIPTION

Many high tech industries need particular kinds of polymers that react in a certain way when exposed to ultraviolet light. The molecular site specific ultraviolet photon absorption usually results in electronically excited states. Polymeric materials may undergo side group or main chain scission and crosslinking as both a result of ultraviolet exposure. The extent of these changes depends on the chemical makeup of a particular polymer and the surrounding environment, but even a small amount of radiation can cause noticeable changes in a polymer's physical or mechanical properties. In some circumstances, even a few cross links or scissions at various sites per polymer molecule can significantly alter the strength or solubility of a polymer, which determines a specific polymer's application in a particular industry.

When polymers are exposed to ultraviolet radiation, bond scission followed by abstraction or combination reactions frequently produces small molecules. Information on these procedures can be very helpful in understanding how radiation induced degradation works. A common sign of a polymeric sample degrading after exposure to ultraviolet light is the development of a particular color. Ultraviolet light is necessary for the photolithographic process, which is a traditional method for fabricating integrated circuits, in the field of microlithography. A crucial step in the creation of silicon chip integrated circuits is microlithography, which involves using ultraviolet light to change the solubility or volatility of thin polymer resist films. Nowadays, ultraviolet radiation is used in almost all commercially available photolithographic devices. Deep ultraviolet, x-rays, and scanning electron beams are used as alternative lithographic techniques to traditional photolithography during the lithography process.

There are many different applications for polymeric materials, including those in space. However, in space, oxygen atom bombardment, ultraviolet radiation, and high energy radiation all have the potential to degrade polymeric materials. Sometimes, such as during solar flares, materials used in space are exposed to hostile radiation environments. As the design lifetime of other space vehicles and satellites has increased, the study of the effects of radiation on polymer materials has become more crucial for aerospace programmes. Therefore, it is necessary to conduct experimental research into how radiation will affect the materials that will be used in aerospace applications. Such characterization would involve knowledge of both the ongoing post-exposure degradation processes as well as the immediate reactions occurring in these materials upon radiation exposure.

Radiation is being used more frequently to sterilise medical and pharmaceutical products due to its convenience as well as concerns about the toxic effects of chemical sterilising agents, which are sometimes used instead. Significant concerns are raised by the radiation sterilisation of biomedical polymeric materials, especially implantable surgical devices. Polymers frequently experience radiation induced degradation that causes discoloration and corresponding property deterioration. To enable the selection of suitable materials for radiation sterilisation, it is necessary to understand the relationship between the chemical makeup of polymeric materials and their radiation sensitivity. The food industry also needs information on radiolysis products because radiation sterilisation of products used in this industry is a common practise. These products can be made of both natural and synthetic polymers. Heat shrinkable films and tubing, cross linked polymers, and grafted copolymers are currently the foundation of major industries. Irradiation of polymers results in a modification of the material's properties. Now that we know more about the chemical processes, this field is entering an era of new technology.

Radiation modified polymers have a wide range of uses, including those in the medical and healthcare industries. These materials can be used as hydrophilic wound dressings, controlled release drug preparations, and implantable materials. Industrially, the irradiation of polymer coatings with ultraviolet and high energy radiation on substrates like optical fibres, metals, and plastics is being developed for a variety of uses. Bacteria on surfaces that come into contact with food can be diminished by ultraviolet-C light. Inactivating or reducing food borne pathogens on fresh meat and ready to eat meat products, as well as how these treatments may affect the food's quality attributes, have been the subject of numerous studies. The most likely effects of ultraviolet-C treatment on the quality of ready to eat food products, such as cured meat and cooked meat products are colour changes and lipid oxidation. Numerous studies have examined how high polymers spectral properties change after being exposed to ultraviolet light for an extended period of time. In a growing number of engineering applications, polymers are gradually replacing traditional materials. Analysing the polymeric materials physical, mechanical, and chemical properties is essential for determining their applicability.