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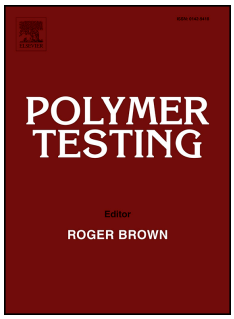

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POLYMER-BASED SENSORS: A REVIEW

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Abstract

Polymers are indispensable component of modern sensor devices. Gauges play an important role in medicine, control of chemical reactions and identification of gases or may even be used as electric noses or tongues. These and many other types of sensors are described in the given article and some real-time applications examples are given among varied types of polymer-based sensors. However, studies on polymer sensors are still ongoing. New solutions are being sought and the mechanisms of the specific reactions occurring in polymer sensors are not fully understood. Their in-depth analysis still requires tremendous work. The attention of this article is drawn to the trends and challenges present in this field of study.

Keywords

polymer-based sensors, multi-sensors, future of detector devices

1. Introduction

Smart materials are somehow troublesome to define in an unequivocal way. They may be defined as substances that react to an impulse coming from an external environment, in the form of a chemical or physical stimulus that results in a specific change in material properties. Then, carrying out particular operations is possible. Looking at this phenomenon closer, it may be stated that each material reacts in a specific way to changes occurring in its environment. An example of such behaviour could be the effect of thermal expansion caused by the increase of ambient temperature or the material's temperature itself. However, such items are not referred to as "smart". This is why it is much more accurate to say that so-called "smart materials" are materials that react to changes in their environment in a specific and usable way, and moreover, this effect is reproducible [1].

These days, a wide range of compounds being developed are polymers. Thanks to the variety of their chemical and physical properties, they can adapt to many applications. In the last two decades, tremendous interest has been shown in polymeric materials that could reversibly or irreversibly change their physical and chemical properties under the influence of external stimuli, e.g., pH, temperature, presence of specific ions, light radiation, mechanical forces, magnetic fields, electric fields, and bioactive molecules. Smart polymers may come in the form of solutions, gels, self-assembled nanoparticles, films, or solids. Currently, not only interesting and peculiar properties of polymers capable of specific reactions to a particular stimulus are being sought. Researchers have been trying to use already known features of such materials in more complex issues, such as controlled delivery of drugs and genes, catalysis, detection and imaging, adaptive coatings, or self-healing materials. Intelligent materials based on polymers, unlike their low molecular weight analogues, exhibit a number of advantages in terms of structural stability, dispersion in aqueous solutions, biocompatibility, ease of processing and subsequent integration with detection devices [2].