Chapter-4

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Smart materials: Properties and Applications

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Abstract

Smart materials are the new generation materials having adaptive capabilities to the external simulations. Few smart material characteristics can be modified under regulated conditions. The smart materials are capable of converting the absorbed energy or their properties can be modified. The 21st century is considered to be an era of smart material. In the beginning, smart material was considered to be the material, which reacts to changes in environments. However, presently smart materials are considered to be the materials that are capable of receiving, transmitting, or processing a stimulus and capable of exerting the desired effect. This chapter highlights some of the properties of smart materials and their important classifications. In the end, some of the important applications of smart materials in day-to-day life as well as various science and engineering fields are discussed.

Keywords: shape memory alloy, piezoelectric, sensors, smart, stimuli.

4.1. Introduction

From the history of human civilization, it is revealed that the standards of living had improved with the discoveries of new materials. The different eras of human civilization were classified according to the discovery and use of materials like the beginning age in history was the Stone Age. The discovery of bronze was the beginning of a new metallurgy era. The Bronze Age was the most revolutionary in history [1]. In the last ten decades, many numbers of systematic researches have been done to synthesize new functional materials. These materials are classified as metals, ceramics, polymers, and smart materials. Smart materials are materials of the present generation having superior property to conventional, functional, and structural materials. Smart materials can adopt under external stimulations like force, pressure, heat, chemicals, electric fields, magnetic fields, and nuclear radiations. These materials can modify their physical properties according to external stimuli in a specific manner. The smartness of a