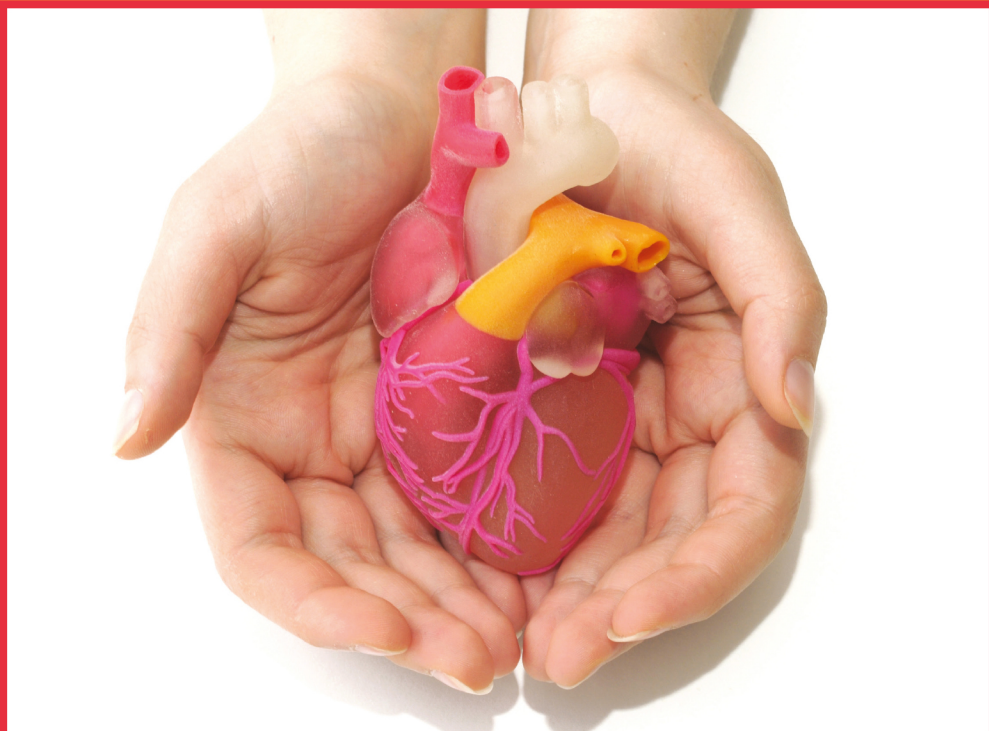


WOODHEAD PUBLISHING SERIES IN COMPOSITES SCIENCE AND ENGINEERING



SMART POLYMER NANOCOMPOSITES

BIOMEDICAL AND ENVIRONMENTAL APPLICATIONS



Edited by
**SHOWKAT AHMAD BHAWANI,
ANISH KHAN AND MOHAMMAD JAWAID**

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Composites Science and Engineering



SMART POLYMER NANOCOMPOSITES

Biomedical and Environmental
Applications

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Manufacturing and design of smart polymer composites

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2.1 Introduction

Smart polymer (SP) is a polymeric sensitive material which is highly sensitive toward stimuli variations especially for environmental parameters, with unique ability to return to the original state. Smart polymeric nanocomposites are also known as stimuli-responsive materials or intelligent materials [1], smart biomaterials [2], or environmentally sensitive polymers [3]. SP is altered according to the slight change in environmental, chemical, biological, and physical factors such as humidity, UV radiation, pH, temperature, heat, intensity of light, and electricity [4–7]. The first smart polymer was designed in 1988 from electro-rheological (ER) fluids to detect viscosity variations from electrical stimuli response [8].

Various kinds of smart polymers exist such as self-healing [9, 10], hydrogels [11], enzyme-responsive [12], magnetic-responsive [13, 14], photo-responsive [15, 16], pH-responsive [4], shape-memory [17], or stress-responsive [18], electric-responsive [19, 20] and temperature-responsive [21, 22] shape memory composites [23]. SP displays many other fascinating applications such as anticounterfeiting [24], nano-coating [25], optical data storage [26], smart solar cells electronics [27, 28], medical devices [29], robotics [30], drug delivery [31], food packaging [32, 33], biotechnology [34], and bioseparation [35].

Even though SPs have complicated nature or design of structures, poor biocompatibility, and low ability for stimuli detection [36], SPs have sensitive ability to analyze the external variations [37, 38]. Current demand is to amend their nature to enhance their biocompatibility and biodegradability [39] and reduce toxic condition [40] to entertain humankind with its excellent applications [41].