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Chapter

Synthesis, Dielectric and Electrical Properties of Silver-Polymer Nanocomposites

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Abstract

Metallic nanoparticles and its composites have emerged as valuable asset in all phases of material science and engineering including electronic, optics and electromagnetic domains. Silver nanoparticles (Ag NPs) are one of the most vital and fascinating nanomaterials among several metallic nanoparticles due to its large surface ratio and outstanding properties with diverse field of potential applications. We demonstrated various synthesis techniques of nanocomposites, silver nanoparticles and composite based on these particles have shown great importance because of the remarkable properties (high electrical and thermal conductivity, good chemical stability and catalytic properties) of silver nanoparticles. This chapter provides various synthesis techniques for preparation of silver nanoparticles and their composites with dielectric and electrical properties in a lucid manner. The detail discussions of silver-polymer nanocomposites, emphasizing on each individual synthesis routes and properties have been carried out.

Keywords: Ag nanoparticles, composites, polymer manocomposites, properties

1. Introduction

In recent decade nanotechnology (nano signify very small that denotes to one billionth or 10^{-9} m in size) is a recognized as one of the most emerging fields of contemporary research deals with synthesis, manufacturing, strategy and tailoring of particle size approximately varying from 1 to 100 nm. The nanoparticles have unique magnetic, electronic and optical properties because of their high surface area to volume ratio and wide variety of applications including environmental health, optics, electronics; optoelectronics, catalysis and energy storage devices [1–6]. Nanoparticles possess small size; composition and shape have differences in their physical and chemical behaviors from their parent materials. Moreover, the smaller size of the nanomaterials also helps them to penetrate exact cellular locations and additional surface area facilitates increased absorption and targeted delivery of the substances [6–8]. A large number of nanomaterials have multitude of technological applicability in the field of engineering including electronics, biomedical, drug-gene delivery, environment, catalysis, light emitters, single electron transistors, non-linear optical or photo-electrochemical devices [9, 10]. The synthesis of nanomaterials by using chemical and physical methods is relatively