

Chapter-6

Silver nanoparticles-based Polymer nanocomposites

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6.1 Introduction

Polymer nanocomposites have been getting a lot of attention lately, and they are now important parts of nanotechnologies. Nanocomposites are interesting because of how well they work, how flexible they are to design, how they are better than the materials they are made of, how cheap they are to make, how easy they are to process, and how many technical and industrial uses they have. Polymer nanocomposites are high-tech functional materials that are made of nanoparticles and nanofillers that are dispersed throughout the polymer matrix.

These reinforcements can be in many different shapes, like rods, fibers, platelets, and spheroids, but they should at least be between 1 and 100 nm in size. In order to make these polymer nanocomposites, every step of the process must follow strict guidelines. These guidelines include controlled/optimized mixing, uniform and stable dispersion, and controlled orientation of the dispersed phase. Polymer nanocomposites have better properties than traditional composites because of the unique properties of nanoparticles, such as their size, high aspect ratio, and high surface area due to their smaller size. These properties are shown in figure 1. The final properties of polymer nanocomposites depend on a) the types of nanoparticles and how their surfaces are treated b) The type of polymer matrix b) The shape of the matrix and the shape of the dispersed phase d) Methods for making polymer nanocomposites, e) Crystallinity and glass transition temperature of the polymer matrix, and f) How the polymer matrix and nanoparticles in it work together.

Silver nanoparticles are by far the most important and interesting of the few metallic nanoparticles³⁴ used in biological applications. They have a lot of good antibacterial, antifungal, anti-inflammatory, and antiviral properties, or they can get those properties by reacting with other substances. Outside of medicine, silver nanoparticles can be used to make things that clean themselves, protect against UV light, make things last longer, make optoelectronics, biosensors, and catalysts³⁵.