



Chapter 14 - Applications of green nanomaterials in electronic and electrical industries

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Abstract

Nanomaterials are functional materials that are created and utilized at nanoscale having one dimension and a size from 1 to 100nm. These materials are considered the significant creation of nanotechnology. The green nanoparticles (NPs) have attracted considerable attention from researchers in the last three decades due to their uncommon properties and various applications in the field of electronics (gas sensor, capacitor, lithium-ion battery, and separator). These unique properties change continuously with a change in the size of nanomaterial. A large number of reports exist on the research work carried out in synthesizing different types of nanomaterial by green methods. The synthesis of green nanoparticles requires plant extracts like flowers, shrubs, leaves, protein, and naturally occurring polymer as natural surfactants. The idea of using greener routes is to reduce the cost, use of toxic reagents, and risks in the lab along with minimizing the waste and power consumption. Nanomaterials include other electrical candidates such as nanowires, nanorods, nanofillers, nanocrystallites, and quantum dots. The formulation of diverse nanoparticles such as metal, bimetallic/trimetallic, metal oxide, metal chalcogenide, silica-based, polymer-based nanoparticles, and hybrid nanomaterials via green source demonstrated excellent electronic/optoelectronic properties and various uses such as sensors, displays, medical diagnostics, transistors, fuel cells, battery manufacturing, etc. The size of green nanoparticles varies with the change in concentration of plant extract and the range of temperature employed. The plant extract plays the role of the reducing/capping agent during the synthesis of green nanomaterials. The methods used for the synthesis of green nanoparticles are the sol-gel technique, hydrothermal method, solvothermal strategy, and coprecipitation. Thus, this chapter covers the synthesis of nanomaterials via greener routes. It also includes the application of such nanomaterials in the electronics and electrical industries.