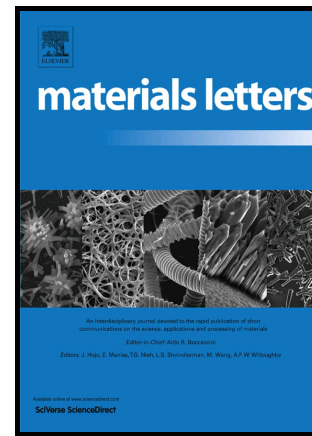


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Green synthesis of palladium nanoparticles using *Chlorella vulgaris*

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Abstract

In this paper, the green synthesis of palladium nanoparticles by *Chlorella vulgaris* aqueous extract was studied. The synthesis of palladium nanoparticles was observed within 10 minutes. The properties of synthesized nanoparticles were confirmed by Transmission Electron Microscopy, Scanning Electron Microscopy, Fourier Transform Infrared Spectroscopy, and UV-spectroscopy. The formation of palladium nanoparticles was confirmed by the presence of an absorption peak between 410- 420 nm using UV-visible spectrophotometer. TEM image revealed that average particle size is 15nm whereas others are in the range of 5 to 20nm. The nanoparticles were crystalline in nature which was confirmed by XRD pattern. FT-IR indicated that polyol and amide groups present in *C. vulgaris* may have participated in the synthesis of palladium nanoparticles. So, functional groups has a critical role in reducing the metal ions in an eco-friendly and non-toxic process.

Keywords

Algae, Biosynthesis, *Chlorella vulgaris*, nanoparticles, Palladium

1. Introduction

The production of nanoparticles can be done through physical, chemical and biological approaches. so that, physical and chemical methods are more expensive and often produce toxic materials specially chemical method that is a common method for producing nanoparticles and is potentially harmful to the environment. But some benefits of biological synthesis are not using of high pressure, toxic chemicals, energy and temperature. Biological synthesis (by bio extract) is non- toxic, cost effective, compatible in the environment, simple methodology and can easily be scaled up for large scale synthesis for the production of large quantities of nanoparticles and the synthesis of nanoparticles by extracts of living organisms may act both as reducing and stabilizing agents [1].

Biosynthesis of some metallic nanoparticles (gold, silver, palladium and iron) have several applications *viz.* biocatalysts, anti-cancer, anti-microbial, anti-viral, cosmetics. [2]. *Chlorella vulgaris* has been used for the

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