Industrial Chemistry

Prasad et al., Ind Chem 2015, 1:1
10.4172/2469-9764.1000104

Research Article Open Access

Keywords: Ag NPs; X-ray di raction; Transmission electron microscopy; Catalytic activity

Introduction

Silver nanoparticles (NPs) have shown remarkable potential for numerous applications in chemical, electronic, medical, and biological elds due to their distinctive properties, when compared to their bulk counterparts [1-3]. Several physical properties of metal can be tailored for a speci c application by controlling their shape, size, and morphology [4,5]. Consequently, there has been a growing need to replace the chemical synthetic procedures with clean, nontoxic, and environmentally suitable "green chemistry" methods. An environmentally benign solvent and eco-friendly capping and reducing agents are the three fundamental elements for a completely green synthesis technique. Accordingly, many researchers have turned toward biological systems such as microorganisms and plants to draw inspiration for green technologies [6-13]. Metal nanoparticles have proven to be the excellent catalysts for inorganic synthesis, pollution treatments and fuel cell, due to their quantum e ect, high surface-to-volume ratio and surface energy [14-16]. In particular, the catalytic properties of the nanoparticles of noble metals such as gold [17-20], platinum [21-23] and palladium [24,25] have been extensively studied in recent years. Relatively, only a few investigations have been focused on the catalytic properties of the silver nanoparticles, although silver metal has already been applied as catalysts for commercial production of ethylene oxide [26,27]. e peel extracts function for bio-reduction of silver ions to yield metallic nanoparticles. Here, we report facile and cost e ective biogenic synthesis of Ag NPs using aqueous extract of papaya peel and to investigate the bio molecules responsible for the synthesis of Ag NPs. Papaya botanical name *Carica papaya*, is an oblong tropical fruit. Papaya (*Carica papaya* L.) or pawpaw belongs to the family of the Caricaceae. is fruit, native to the tropics of America is now spread throughout the world [28]. Solo, Formose, Sunset, Golden and Sunrise are the most common varieties [29]. e fresh fruit is attractive to consumers due to its striking odours, high vitamin content (i.e., vitamin A and C) and high ber content [30]. Moreover, the fruit's dietary value, papaya stems, leaves and fruits contain high levels of proteins and vitamins which are used in the elaboration of cosmetics and medications. Further, the catalytic activity of synthesized Ag NPs in the reduction of 4-nitrophenol (4-NP) was studied by UV-vis absorption spectroscopy.

Experimental Section

Preparation of leaf extract from Papaya peel

Papaya peel is thoroughly rinsed with double distilled water to remove the ne dust particles and then the Papaya Peel is dried under shade at room temperature for 24 h under dust free condition. e dried Papaya peel was grinded with a mortar and pestle to make a powder. An amount of 10 g of Papaya Peel powder is mixed in to 100 mL double distilled water and re uxed for 1 h, at 80ºC until the color of aqueous extract solution changes from watery to pale yellow. e resultant composition is cooled to room temperature and ltered with a Whatman No. 1 lter paper and the nal extract is stored at 4ºC for further use.

Synthesis of silver nanoparticles

30 mL of 1 mM aqueous solution of silver nitrate was taken in Erlenmeyer ask and then 5.0 mL and 10 mL of Papaya Peel extract was added to the above solution separately at room temperature and stirred for 1 h. en the reaction ask was kept at room temperature for Overnight. Finally, the color of solution changed from pale yellow to dark brown color was developed which indicates formation of Ag NPs. As the present method for the synthesis of Ag NPs with Papaya Peel

***Corresponding author:** P Venkateswarlu, Biopolymers and Thermo Physical Laboratories, Department of Chemistry, Sri Venkateswara University, Tirupati-517 502, Andhra Pradesh, India, Tel: +91-9393600444; E-mail: ponneri.venkateswarlu@gmail.com

Received October 05, 2015; **Accepted** October 14, 2015; **Published** October 21, 2015

Citation: Prasad CH, Srinivasulu K, Venkateswarlu P (2015) Catalytic Reduction of 4-Nitrophenol Using Biogenic Silver Nanoparticles Derived from Papaya (*Carica papaya*) Peel extract. Ind Chem 1: 104. doi: 10.4172/2469-9764.1000104

extract in aqueous solution was made without any additional hazardous chemicals, this pathway satis es pure green eco-friendly process.

Characterization techniques

UV-Vis absorption spectra of the transparent colloid solution were performed on UV-Vis Spectrometer (Shimedzu 2400 UV-Vis double beam model) at a resolution of 1 nm in 200 - 800 nm wavelength range.

e FT-IR spectra of silver nanoparticles and Papaya peel extract was carried out with a ermo Nicolet FTIR-200 thermo electron corporation. e phase purities of as synthesized compounds were checked by XRD technique. e X-ray di raction measurements were recorded on a Seifert 3003 TT X- ray di ract meter with Cu Kα radiation with a wave length of 1.52 Å. e morphology and diameter of silver nanoparticles were determined with a Phillips, TECHNAI FEI 12 transmission electron microscope (TEM) and the quantitative elemental analysis of the nanoparticles were carried out an Oxford instruments Inca Penta FET x 3 Energy dispersive spectrum (EDS).

Citation: Prasad CH, Srinivasulu K, Venkateswarlu P (2015) Catalytic Reduction of 4-Nitrophenol Using Biogenic Silver Nanoparticles Derived from Papaya (*Carica papaya*) Peel extract. Ind Chem 1: 104. doi: 10.4172/2469-9764.1000104

Citation: