

Green synthesis of silver nanoparticles using *Melaleuca cajuputi* Powell leaves extract and their antioxidant activity and catalytic degradation of dyes

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Abstract:

Nowadays, release of hazardous dyes from textile industries in water bodies like lakes, rivers and groundwater has become a serious problem, which contributes to increase their pollution levels significantly. These pollutants are difficult to remove by traditional water treatment procedures. Therefore, there is still a need to develop more suitable methods for effluent treatment. Here, silver nanoparticles were produced using *Melaleuca cajuputi* Powell leaves. The obtained materials were characterized using UV-Vis spectroscopy SEM/EDX, LPSA, and FTIR techniques. UV-Vis spectra showed maximum absorption peak at 406 nm, which represents the characteristic surface plasmon resonance of the nanosilver. The structure of the particles was spherical as observed in SEM. FTIR analysis was carried out to probe the possible functional groups involved in the synthesis of AgNPs. LPSA data showed the mean particle size 49 ± 1.0 nm. The obtained silver nanoparticles were then utilized as nanocatalyst for decolorization of methylene blue (MB) and methyl orange (MO) dye solutions. The report emphasizes that the AgNPs are observed to be an excellent catalyst on reduction of both hazardous dyes with the percent degradation of MB and MO were 92.41% 89.08%, respectively. Moreover, AgNPs synthesized had higher anti-DPPH radical activity than extract.

Keyword : Green synthesis, Silver nanoparticles, *Melaleuca cajuputi* Powell, Antioxidant activity

1. Introduction

In recent years, enormous of research has been carried out in the area of nanosynthesis by using green source and easily available materials with the purpose to reduction for environmental threats. Silver nanoparticles (AgNPs) are interesting materials that have been considered widely. The nanoscale materials possess unique optical, electrical as well as biological properties and are thus applied in catalysis, biosensing, nanodevice fabrication imaging, drug delivery and medicine (Bonnia, N. N. *et al*, 2016). Nowadays, release of hazardous dyes from textile industries in water bodies like rivers, lakes and groundwater has become a serious problem, which contributes to increase their pollution levels (Jethave, G. *et al*, 2017). These pollutants are difficult to remove by traditional water treatment procedures. Therefore, there is a requirement to develop more suitable methods of effluent treatment. Nonetheless, it is difficult to remove these dyes from water, because of their aromatic structural stability. Nano-catalysts are one of the likely agents for the reduction of synthetic dyes (Rostami, V. A. *et al*, 2016; Dai, R. *et al*, 2009; Naik, B. *et al*, 2011; Ilunga, A. K. *et al*, 2016). Therefore, in this work, we have been studying the degradation of MB and MO dyes using the green-synthesized AgNPs as catalyst in the presence of sodium borohydride (NaBH_4) under sonocatalytic process. Green synthesis of AgNPs was done using *Melaleuca cajuputi* Powell aqueous leaves extract as bio-reducing agent.