



“Gheorghe Asachi” Technical University of Iasi, Romania



ECO-FRIENDLY SYNTHESIS OF SILVER NANOPARTICLES USING *Gazania rigens* AND EVALUATION OF ACTIVITIES

Tayyaba Shahzadi*, Amina Kanwal, Hifzah Jabeen, Tauheeda Riaz, Maria Zaib

Department of Chemistry, Government College for Women University, Sialkot-51310, Pakistan

Abstract

The present study describes the facile synthesis of silver nanoparticles (AgNPs) by green method using aqueous extract of *Gazania rigens*. The size, morphological, compositional and optical properties of silver nanoparticles were examined through X-ray diffraction (XRD), Energy Dispersive X-ray spectroscopy (EDX), Scanning Electron Microscope (SEM), and UV-Vis spectroscopy respectively. Ultraviolet-Visible spectra showed the absorbance band between 425–460 nm which indicated the synthesis of stable AgNPs. Average size of AgNPs was calculated from XRD spectra as 31.35 nm. SEM and EDX spectra confirmed the synthesis of spherical shaped AgNPs. FTIR spectra showed that different functional groups were present in aqueous extract of plant which acted as reducing agents in the formation of stable silver nanoparticles. The value of DPPH radical inhibition by AgNPs was $75.45 \pm 1.12\%$ at 1000 $\mu\text{g/mL}$ concentration revealing its moderate antioxidant activity. Synthesized AgNPs showed good total phenolic contents (262.60 ± 1.2 mg/g GAE) as well as good total antioxidant activity (1.11 ± 0.07). Then the synthesized AgNPs were used as catalyst for the removal of toxic organic dyes i.e methylene blue (MB) and congo red (CR). Various factors like temperature, pH, adsorbent dosage, dye concentration and contact time were examined and optimized for maximum removal of dyes. Thermodynamic factors like enthalpy (ΔH°), Gibb's free energy (ΔG°), and entropy (ΔS°) of the system were also determined. Kinetics of the system was studied with the help of Lagergren's model. Adsorption parameters were also calculated using Langmuir and Freundlich, isotherm models.

Keywords: congo red, *Gazania rigens*, kinetic, methylene blue, thermodynamic

Received: December, 2019; Revised final: July, 2020; Accepted: July, 2020; Published in final edited form: January, 2021

* Author to whom all correspondence should be addressed: e-mail: tayyaba332@gmail.com; tayyaba.shehzadi@gcwus.edu.pk; Phone: (+92)-52-9250170