Chitosan/PVA Supported Silver Nanoparticles for Azo Dyes Removal: Fabrication, Characterization, and Assessment of Antioxidant Activity

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Support information

Chemicals

$AgNO_3$ (≥99), Chitosan (low molecular weight), Poly (Vinyl Alcohol) (PVA, ≥ 99+%), Methylene blue, Methylene orange, Methylene red, safranin, crystal violet, and all other chemicals were supplied from Sigma Aldrich.

Analysis of AgNPs@Chitosan/PVA Nanocomposite

UV-Vis absorption spectra were measured in the PerkinElmer Lambda 750 instrument in the scanning range of 200-800 nm. TEM analysis was performed using a JEOL JEM 100 kV transmission electron microscope. XRD analysis was performed using the Rigaku MINIFLEX 600 X instrument. PerkinElmer FTIR spectrum was used to find biomolecules involved in green synthesis.

DPPH test

The antioxidant activity of AgNPs@Chitosan/PVA nanocomposite was determined using the 250 µL of DPPH solution was added to 3 mL of nanocomposite solution at different concentrations (5, 25, 50, and 100 µg/mL). Ascorbic acid was used as a positive control in the DPPH study. DPPH was used as a negative control. Antiradical activity, expressed as percent inhibition (%) of the DPPH radical, was calculated by determining the decrease in absorbance upon the addition of test samples.

The DPPH radical scavenging activity was determined according to equation (2):

$$\text{DPPH scavenging percentage (\%)} = (A_c - A_t)/ A_c \times 100 \quad (2)$$

where A_c and A_t are the absorbance of the control and test samples, respectively (after 30 minutes, at 517 nm).

H_2O_2 antioxidant test

Antioxidant activity was determined by H_2O_2 free radical scavenging assay using the Pick and Mizel method. 100 µL of H_2O_2 solution (5 mM) was added to different concentrations (5, 25, 50, and 100 µg/mL) of AgNPs@Chitosan/PVA nanocomposite and absorbance was read at 230 nm after 20 minutes of incubation [33]. Ascorbic acid was used as a positive control. H_2O_2 was used as a negative control. The following equation was used to determine the H_2O_2 radical scavenging ability (2):

$$H_2O_2 \text{ scavenging percentage (\%)} = (A_c - A_t)/ A_c \times 100 \quad (2)$$