

Synthesis of Silver Nanoparticles Adsorbent from Phytolacca Dodecandra 'Endod' Leaf to Water Treatment, at Almeda Textile Factory, Tigray Ethiopia

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Abstract : Water pollution is one of the most feared problems in modern societies, especially in developing countries like Ethiopia. Nanoparticles with controlled size and composition are of fundamental and technological interest as they provide solutions to technological and environmental challenges in the areas of solar energy conversion, catalysis, medicine, and water treatment. The synthesis of metallic nanoparticles is an active area of academic and, more importantly, application research in nanotechnology. Adsorption is a process in which pollutants are absorbed on a solid surface. A molecule (pollutant) adhered to the solid surface is called an adsorbate, and the solid surface is an adsorbent. Adsorption is controlled by various parameters such as temperature, the nature of the adsorbate and adsorbent, and the presence of other pollutants along with the experimental conditions (pH, concentration of pollutants, contact time, particle size, and temperature). Depending on the main problem of water pollution, this research is available on the adsorption of wastewater using silver nanoparticles extracted from phytolacca Dodecandra leaf. AgNP was synthesized from a 1mM aqueous solution of silver nitrate (AgNO₃) and Phytolacca Dodecandra leaf extract at room temperature. The synthesized nanoparticles were characterized using UV/visible Spectrometer, FTIR and XRD. In the UV-Vis spectrum, The Surface Plasmon resonance (SPR) peak was observed at 414 nm, which confirmed the synthesis of AgNPs. FTIR spectroscopy, recorded from 4000 cm⁻¹ to 400 cm⁻¹, indicated the presence of a capping agent with the nanoparticles. From the XRD results, the average crystalline size was estimated to be 20 nm Confirming the nanoparticle nature of the obtained sample. Thus, the present method leads to the formation of silver nanoparticles with well-defined dimensions. The effects of different parameters like solution pH, adsorbent dose, contact time and initial concentration of dye were studied. The concentration of MB is 0.01 mg/L and 0.002 mg/L before and after adsorption, respectively. The wastewater containing MB was well purified using AgNP adsorbent.

Keywords : wastewater, silver nanoparticle, Characterization, adsorption, parameter

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