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Green synthesis of cobalt-oxide nanoparticle using jumbo Muscadine (*Vitis rotundifolia*): Characterization and photo-catalytic activity of acid Blue-74

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ABSTRACT

In the recent years, plant and microbial extract based nanoparticles (NPs) have become a sophisticated technology serving as an alternative strategy for the purpose of developing materials functionalized by structural diversity and enhanced energy efficiencies. Cobalt oxide nanoparticles (GCoO-NPs) have wide applications in several sectors due to their high resistance to corrosion as well as oxidation, ecofriendly nature, cost effectiveness and nontoxic potential. Plant based particles are credible alternatives as they reduce the burden of complicated and laborious protocols of physiochemical reliance. In this study, GCoO-NPs were synthesized using the grape Jumbo Muscadine (*Vitis rotundifolia*) using co-precipitation. The synthesized GCoO-NPs were characterized by UV–Vis spectrophotometer, Fourier transform infrared spectroscopy (FTIR), Powder X-ray diffraction (PXRD) and Scanning electron microscopy (SEM). The photocatalytic activity of the GCoO-NPs was estimated by the degradation of Acid Blue-74 (AB-74) dye and the complete degradation of 98% was accomplished at the reaction time of 150 min at pH 10 and 60 mg/100 mL concentration. The outcomes of this study indicated the excellent performance of the GCoO-NPs on par with some of the earlier findings and this can be an appealing aspirant of extreme potential to be employed as a catalyst alternative to the conventional wastewater treatment methods.

1. Introduction

With an increasing population, there is a high demand for several basic raw materials and concluding commercial products that are increasing exponentially. Global economic growth and industrial revolutions have led our world into a phase of rapid industrialization. Synthetic dyes have found extensive applications in several sectors to remain at pace with the up-to-date technology as they exhibit a considerable structural diversity [1,2]. However, the major drawback is that the effluents from the industries employing these dyes pose a heavy threat to the water and environment systems in which they are released leading to an imbalance in the ecology. Hence, there is a dire need for such particles to be removed before they are discharged into rivers and lakes for preventing health hazards as most of them are essentially toxic to the plants, microbes and protozoa living in the water and are recalcitrant to discoloration as well as degradation [3,4].

Targeting to defend and save the ecological and inhabiting environment, a sustainability plan from green chemistry has earned unique examination concerns. Earlier, several manufacturing methods such as substantial utilization of synthetic dyes in various manufacturing sectors, e.g., fabric, fur, newspaper, synthetic, cooking, cosmetics cosmeceutical and therapeutics have caused severe environmental and health risks [5,6]. Moreover, their unrestricted or unrestrained discharge into the central water stream along with incomplete and ineffective processing results in substantial environmental pollution. Undeniably, the manufacturing segment is a vital operating power for the financial and technical advancement of the society. Despite that, the increasing manufacturing advancement

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