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REVIEW

Microbial Pigment-Mediated Synthesis of Metal Nanoparticles

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Abstract

Over the past few years, there has been an increasing fascination with environmentally conscious techniques for the synthesis of nanoparticles, due to the drawbacks associated with conventional methodologies. These conventional methods frequently depend on the utilization of hazardous chemical substances and yield substantial waste, resulting in detrimental ecological contamination. As a result, alternative strategies utilizing plants and microorganisms such as bacteria, fungi, algae, and their metabolites have gained attention. Microbial pigments (MPs) have gained significant attention in recent years due to their versatile bioactivities. This field of research combines the unique properties of MPs with the diverse applications of metal nanoparticles (MNPs), resulting in a range of promising outcomes. In microbial pigment-mediated nanoparticles (MP-MNPs) synthesis, the biological activities, chemical diversity of pigments, solubility in aqueous medium, lower reaction time, and renewable energy account for high rate of MNPs synthesis with divers shapes and sizes along with corresponding applications. Furthermore, it mitigates the use of harmful chemicals and reduces the generation of waste associated with conventional methods. However, care has to be taken to select suitable MPs for MNPs synthesis, such as in terms of solubility, stability, non-toxicity, and extraction of pigment. This review focuses on the utilization of MPs in the fabrication of MNPs, discussing the possible mechanisms and applications of the synthesized nanoparticles. The advantages and limitations of the microbial pigment-mediated synthesis of different MNPs are also summarized in this review.

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