Smart Nanomaterials Technology

Azamal Husen *Editor*

Sustainable Uses of Aromatic Plants in Nanotechnology

Springer

Contents

Aromatic Plants and Their Role in Metal Oxide Nanoparticle Synthesis, Characterisation and Applications

Mohd Arsh Khan, Neda Tabassum, Abdul Rahman Khan, Fakhra Jabeen, and Qazi Inamur Rahman

Abstract The rapid advancement of nanotechnology has sparked growing interest in sustainable, green approach for fabrication of nanoparticles (NPs). Aromatic plants, which are rich in phytochemicals such as flavonoids, terpenoids, phenolics and alkaloids, offer an eco-friendly and cost-effective alternative to conventional chemical methods. This chapter highlights the significant role of aromatic plant extracts in the biosynthesis of metal oxide nanoparticles (MONPs), emphasising functions of phytochemical as reducing and stabilising agent and how various physicochemical parameters influence NP growth. Moreover, the chapter also explores the use of different analytical techniques such as UV-Vis spectroscopy, Fourier-transform infrared spectroscopy (FTIR), X-ray diffraction (XRD) and zeta potential to characterise the properties of synthesised NPs. In addition, the application of biosynthesised MONPs in catalysis, agriculture, environmental remediation and biomedicine has been overviewed, demonstrating their multifunctional potential.

Keywords Aromatic plants · Catalysis · Environmental remediation · Biomedicine · Green synthesis

1 Introduction

Nanoparticles (NPs) are typically defined as particles with dimensions ranging from 1 nm to 100 nm. However, in certain biotechnology and biomedical applications, their size range can be expanded up to 500 nm. Owing to exceptional physical, chemical and electrical properties, NPs have developed across various domains such as catalysis, electronics, targeted medication administration, water sensing and

M. A. Khan · N. Tabassum · A. R. Khan · Q. I. Rahman (✉)
Department of Chemistry, Integral University, Lucknow, Uttar Pradesh, India
e-mail: qirahman@iul.ac.in

F. Jabeen
Department of Physical Sciences, College of Science, Jazan University, Jazan, Saudi Arabia

A. Husen (ed.), *Sustainable Uses of Aromatic Plants in Nanotechnology*, Smart Nanomaterials Technology, https://doi.org/10.1007/978-981-95-7409-4_5