

The Role of Carbon Nanofibers in Soil Enhancement: A Path to Sustainable Agriculture

Dr. Suman D. Tripathi¹, Ms. Swati Singh², Dr. Jayashri S. Shukla³

Department of Chemistry^{1,2,3}

K. M. Agrawal College of Arts, Commerce & Science, Kalyan (W), Maharashtra, India

Corresponding Author: Dr. Suman D. Tripathi

Email: sumandtripathi@gmail.com

Abstract: Carbon nanofibers (CNFs) have shown great potential in multiple applications. These explore the synthesis, properties, and potential uses of CNFs, focusing on their structural characteristics, methods of production, and practical applications. CNFs are distinguished by their high aspect ratios, significant surface areas, and excellent electrical and thermal conductivities. These properties make them suitable for various applications, including reinforcement in composite materials, energy storage, environmental remediation, and biomedical uses. The various studies investigated several synthesis techniques, such as chemical vapor deposition, electrospinning, and carbon arc discharge, each offering specific advantages in terms of control over morphology and scalability. Moreover, the various studies investigated the interaction of CNFs with soil, demonstrating their potential to enhance soil properties by improving nutrient retention and water holding capacity, which can be beneficial in agricultural applications. The present study indicates that CNFs can significantly influence soil conductivity and structure, thereby impacting water and nutrient dynamics. This comprehensive examination of CNFs aims to provide insights into optimizing the application scope, highlighting the role in advancing materials science and environmental sustainability.

Keywords: Nanomaterials, Carbon nanofibers (CNFs), soil property, soil interaction, nutrient leaching, water retention, soil conductivity, agricultural applications

