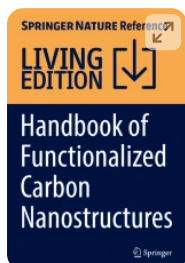


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# Handbook of Functionalized Carbon Nanostructures

From Synthesis Methods to Applications

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## Overview

**Editors:** [Ahmed Barhoum](#), [Kalim Deshmukh](#)

Discusses applications of carbon materials in healthcare, energy production and automotive industries


Targeted at materials scientists, chemical and biomedical engineers, and chemists in industry and academia

Complete reference on the synthesis, functionalization, characterization and application of carbon nanomaterials

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## About this book

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This book highlights all newly reported carbon nanostructures including graphene and its derivatives, carbon nanotubes, metal organic frameworks, fullerenes, nanorods, nanospheres, nano onions, porous nanoparticles, nanohorns, nanofibers and nanoribbons, nanodiamonds, graphitic carbon nitrides, carbon aerogels and hydrogels, graphdiyne and graphenylene. It presents the historical development of carbon nanostructures technologies, different types and classifications, and different fabrication and functionalization techniques, including outer/inner surface functionalization and covalent and noncovalent functionalization. This Handbook discusses the unique properties of functionalized carbon nanostructures that can be obtained by modifying their structures, composition, and surface. It gives the reader an in-depth look at the current achievements of research and practice while pointing you ahead to new possibilities in functionalizing and using carbon nanomaterials. Finally, it covers the various applications of functionalized carbon nanostructures including adsorbents, additives, active materials in energy accumulating systems (batteries, hydrogen storage systems, and

supercapacitors), filtering media, catalysts or supports for catalysts, sensors or substrates for sensors, additives for polymers, ceramic composites, metal and carbon alloys, glasses, digital textiles, and composite materials.

## Keywords

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[Carbon nanostructures](#)

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Search within this book

 Search

## Table of contents (69 entries)

---

### **Spectroscopic and Microscopic Characterizations of Functionalized Carbon Nanostructures**

Pratik Kolhe, Maitri Shah, Sonu Gandhi

---

### **Surface Grafting of Carbon Nanostructures**

Shikha Awasthi, Suranjan De, Sarvesh Kumar Pandey

---

### **Synthesis of Carbon Nanostructures from Waste Materials**

Wan Hazman Danial

---

## **Thermal and Rheological Properties of Carbon Nanoparticle Dispersions**

Behnaz Ranjbar, Sahar Foroughirad, Zahra Ranjbar

---

## **Two-Dimensional Carbon Graphdiyne**

Humira Assad, Praveen Kumar Sharma, Ashish Kumar

---

## **Two-Dimensional Carbon Graphenylene**

Ehsan Hajjalilou, Armin Rezanezhad, Muhammad Bilal Hanif, Martin Motola

---

## **Unique Nanostructures of Carbon Nano Onions**

Anbu Mozhi Thamizhchelvan, Nathan Lien

---

## **Vapor Phase Production of Carbon Nanostructures**

Soheila Sharafinia, Alimorad Rashidi, Behnam Babaei

---

## **Wet-Chemistry Synthesis of Carbon Nanostructures**

Dejian Dai, Jiyang Fan

---

[< Previous](#)   [1](#)   [2](#)   [3](#)   [4](#)

[Back to top](#) ↑

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**Ahmed Barhoum** is associate professor of nanomaterials science & nanomanufacture engineering. In 2020, he joined the National Centre of Sensor Research at DCU University in Ireland. Previously, he has worked as a staff scientist and postdoc researcher in several international groups, amongst others in Egypt, Belgium, Germany, France, China, among others. Prof. Barhoum research is multidisciplinary in nature as it is at the interface between Nanoscience, Material Science, and Chemical Engineering. His current research interests focus on the fabrication of nanoparticles and nanostructured materials for application in Fuel Cells, Biosensors, and Drug Delivery. He has won several scientific awards, grants, and prizes: Irish research council fellowship (2021), Helwan University Price for Academic Excellence (2020), Helwan University Price for Academic Excellence (2019), Chinese Academy of Science fellowship (China, 2019), Institut français d'Égypte fellowship (France, 2018), Research Foundation Flanders Fellowship (Belgium, 2015 and 2016), Medastar Erasmus Mundus Scholarship (Belgium, 2012), Welcome Erasmus Mundus scholarship (Italy, 2012), Institut français d'Égypte fellowship (France, 2012), Gold Medal from Egyptian Syndicate of Scientific Professions (2007), and Gold Medal from Helwan University (2007), and many more. He is an expert evaluator for several funding organizations e.g. National Science Center (Poland), Czech Science Foundation (Russia), Swiss National Science Foundation (SNSF, Switzerland), and a reviewer for +20 peer-reviewed journals. Ahmed Barhoum is also PI of more than 10 International Projects, Co-organizer of 7 conferences, Editor of 8 Handbooks (Elsevier and Springer Nature), co-authored of +100 publications, and effectively supervised 12 master's and Ph.D. students.

**Kalim Deshmukh** is presently working as a senior researcher at the New Technologies–Research Centre, University of West Bohemia, Pilsen, Czech Republic. He has over 17 years of research experience in the field of synthesis, characterizations and investigations of structure–property relationship of a wide variety of polymeric materials, polymer blends and nanocomposites for various technological applications. His research interest is mainly focussed on the synthesis, characterization and property investigations of polymer nanocomposites reinforced with different nanofillers including nanoparticles and carbon allotropes such as carbon black, carbon nanotubes, graphene, graphene oxide, graphene nanoplatelets and graphene quantum dots for potential electronic applications. He has over 95 research publications in peer-reviewed journals and 30 book chapters (h-index = 33; >3700 citations) with renowned international publications including the Royal Society of Chemistry, Elsevier, Springer and Taylor & Francis. In addition, he has co-edited two books on the topics “3D and 4D Printing of Polymer Nanocomposite Materials: Processes, Applications and Challenges” and “MXene and their Composites: Synthesis, Properties and Potential Applications” for Elsevier. Presently, he is editing three books for Elsevier on the topics “Biodegradable and Biocompatible Polymer nanocomposites: Processing, Characterizations and Applications”, “Functionalized Nanofibers: Synthesis and Industrial Applications”, and “Advanced Fluoropolymer Nanocomposites: Fabrication, Processing, Characterizations and Applications,” two books for Wiley–VCH on the topic “Nanotechnology Based Additive Manufacturing: Product Design, Properties and Applications,” and “Nanostructured Materials for Energy Storage”, and one book for Wiley–Scrivener on the topic “Two–Dimensional Nanostructures Based Polymer Nanocomposites: Processing, Properties and Applications”. Moreover, he has actively participated and presented his research work in several international conferences and also he has been serving as a reviewer for over 60 reputed international journals.

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