

A Text Book on

NANOCHEMISTRY

KALPANADEVI K

A TEXT BOOK ON NANOCHEMISTRY

By

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Preface

The present book entitled “A Text Book of Nanochemistry” contains the essentials of nanochemistry, which include introduction on nanomaterials, their properties, preparation methods and applications. This book will cater to the need of all the students at the BSc., and MSc., level.

The book is written in a simple language so that it will be easier for the students studying in the medium other than English.

It is hoped that the book will be liked by the students and the teachers as well.

I am grateful to a number of authors whose works have been freely consulted while preparing this book.

I am highly thankful to my husband, daughters and my parents for their moral support and encouragement they have shown towards the successful publication of this book.

Dr. K. Kalpanadevi

Dedicated to
My Daughters

CONTENTS

1. Introduction

Classification of nanomaterials

- On the basis of the origin
 - Natural nanomaterials*
 - Artificial nanomaterials*
- On the basis of dimension
 - Zero dimensional (0-D)*
 - One dimensional (1-D)*
 - Two dimensional (2-D)*
 - Three dimensional (3-D)*
- On the basis of composition
 - Carbon Based Nanomaterials*
 - Metal Based Materials*
 - Nanocomposites*

2. Properties of nanomaterials

- Electrical properties
- Optical properties
- Magnetic properties
- Mechanical properties

3. Synthesis of nanomaterials

- Top-down and Bottom-up approach
- Physical methods
 - Ball Milling*
 - Plasma Arcing*
 - Physical vapor deposition (PVD)*
 - Electrodeposition*
 - Molecular Beam Epitaxy (MBE)*
 - Laser ablation*

- Chemical methods

Chemical vapor deposition (CVD)

Sol-gel method

High temperature thermal decomposition method

Liquid-liquid interface reaction

Hydrothermal method

Chemical reduction method

4. Characterization of nanomaterials

- Scanning Electron Microscopy (SEM)
- Transmission Electron Microscopy (TEM)
- Atomic Force Microscopy (AFM)
- X-Ray Diffraction (XRD)

5. Applications and hazards of nanomaterials

- Applications of nanomaterials

Applications of nanomaterials in environment

Applications of nanomaterials in industry

- Hazards of nanomaterials

Hazards of nanomaterials to human health

Hazards of nanomaterials to environment

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