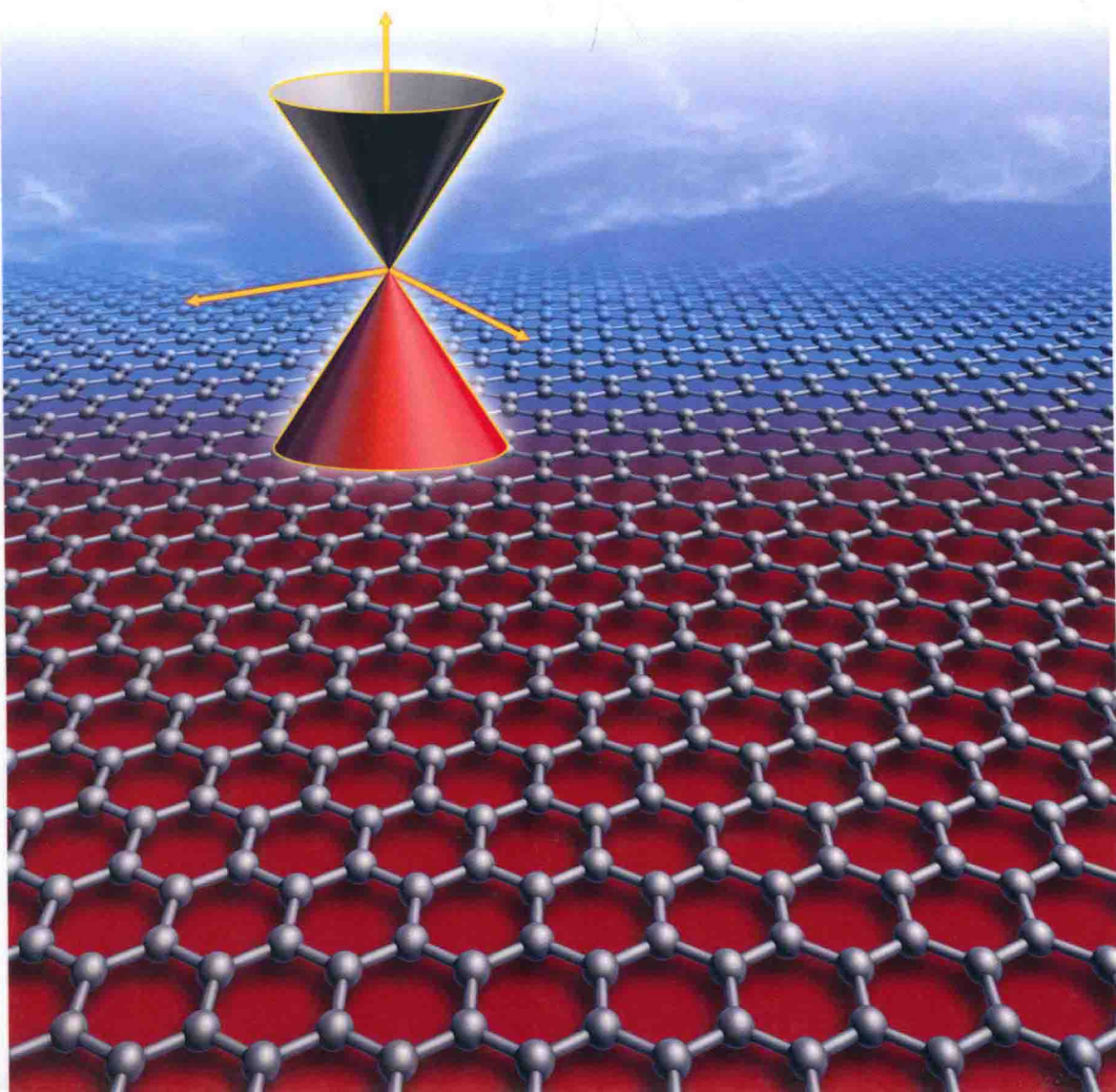


Edited by C. N. R. Rao and A. K. Sood

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Graphene

Synthesis, Properties, and Phenomena



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Synthesis, Properties, and Phenomena



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Preface

Graphene is a fascinating subject of recent origin, its first isolation being made possible through micromechanical cleavage of a graphite crystal. Since its discovery, graphene has caused great sensation because of its unusual electronic properties, and scientists from all over the world have been working on the varied facets of graphene. Thus, there has been much effort to synthesize both single-layer and few-layer graphenes by a number of methods. A variety of properties and phenomena have been investigated, and many of the studies have been directed toward understanding the physical and chemical properties of graphene. Raman spectroscopy has been particularly useful in unraveling various aspects of graphene. A graphene field-effect transistor, a basic building block of nanodevices, is a single-element laboratory to study electron–phonon interactions using Raman scattering. The low-frequency electrical noise or the flicker noise in graphene devices defines the figure of merit of a device and has contrasting behavior for single- and bilayer-graphene devices. Magnetic properties have been of equal interest with the indication that graphene may be ferromagnetic at room temperature, exhibiting magnetoresistance. Graphene nanoribbons have attracted attention because of their unique electronic structure and properties. Graphene also provides a playground for exploring many quantum field related phenomena such as Klein tunneling, antilocalization, zitterbewegung, vacuum collapse by Lorenz boost and so on. Suspended graphene devices have been used to study nanoscale electromechanics and quantum Hall effect.

A variety of applications of graphene have come to the fore. Its use in supercapacitors and batteries has been explored. Other properties of graphene, which are noteworthy, are those that enable its use in nanoelectronics, field emission and catalysis. Biological aspects of graphene have been investigated by a number of workers, with emphasis on its toxicity and its possible use for drug delivery.

In this book, we have tried to cover many of the salient aspects of graphene, which are of current interest. Although the book mostly deals with graphene, we have included some material on graphene-like inorganic layered materials. It is possible, however, that some topics have been left out owing to constraints on the size of the book and possible errors in judgement. We trust that the

book will be useful to students, teachers, and practitioners, and serves as an introduction to those who want to take part in the exciting developments of this subject.

June 2012

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