

# FRONTIERS IN HIGH DENSITY PHYSICS

Editor  
**Dr. Mahmuda Begum**



## **Frontiers in High Density Physics**

A book on research works of High Density Physics, edited by Dr. Mahmuda Begum and Published by Purbayon Publication, Panbazar, Guwahati-1

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## **Preface**

**Frontiers in High Density Physics** is a book which will act as a platform for the recent research works of High Density Physics. The book describes about Plasma physics and its applications, Fundamentals of dusty plasma, Fundamentals of high density QCD, Acoustic wave modes in plasma, Thermodynamics of dusty plasma, Transport phenomena of dusty plasma such as Diffusion, Thermal conductivity, Viscosity etc. The book is a balanced presentation in that it gives both a theoretical treatment and practical applications. Different researchers across the globe have contributed in this book.

I sincerely acknowledge the valuable suggestions and support received from Department of Physics, Lakhimpur Girls' College for publishing the book.

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# **Fundamentals of Dusty Plasmas**

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## **Introduction:**

Plasma is considered as one of the most disordered forms of matter which represents a quasi neutral gas of charged particles (ions and electrons) and neutral atoms or molecule (neutrals) that exhibits collective behavior [1]. In 1929, Irving Langmuir define plasma as the fourth state of matter. The charged particles in plasma interact with the local electromagnetic field, and collective motion of these charges can generate electric and magnetic fields. It is remarked that 99% of the baryonic content of the Universe consists of plasma.

Plasmas are quite common in the universe. Astrophysical environments like stars, comets, nebulae, interstellar space, the solar system etc. are filled with plasma. Terrestrial plasmas occur in lightning, a variety of laboratory experiments, and a growing array of industrial processes. Earth is completely surrounded by plasma trapped within its magnetic field. Plasmas involve in many everyday appliances e.g. in neon light used for commercial purposes, fluorescent light, such as compact fluorescence light sources (CFL's), which have a higher efficiency than the traditional incandescent light sources, in modern display screens, organic light-emitting diodes (OLEDs), plasma torches etc. [2] . In addition plasmas have also

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