

Preface

Feedback from many colleagues has motivated me to prepare the present second enlarged edition of *Plasma Physics*. The scope of this book has been extended to cover recent developments in plasma devices, to update the rapidly evolving field of dusty plasmas, and to describe plasma diagnostics in more detail.

Four chapters have been substantially expanded. In Chap. 4, the diffusion processes in gas discharges are now introduced by means of random walks, which illuminate the difference between deterministic motion in external fields and random processes. Chapter 7 has been reorganized to separate general statements about the plasma-sheath transition from applications in plasma diagnostics. Langmuir probe diagnostics is now introduced in two steps, beginning with the elementary theory of plane probes and advancing to the tricks of the trade in probe measurements. These comprise the influence of low-frequency and high-frequency voltages on Langmuir probe diagnostics. The passive and active compensation methods for Langmuir probes in rf discharges are described. In Chap. 10, refined charging models are discussed. Plasma crystals are described with regard to solid-liquid phase transitions and the formation of spherical Yukawa balls. The puzzling phenomenon of attractive forces from wake charging is discussed in detail. Chapter 11 has a new section on sputtering magnetrons and high-power impulse magnetron sputtering. The section on capacitive rf discharges has been extended by a discussion of the recently discovered electrical asymmetry effect.

I thank Nils Brenning, Holger Kersten, André Melzer, and Iris Pilch for their critical comments on the extended chapters. Eberhard Möbius and his students gave valuable hints at many typos in the first edition. The enthusiasm of my PhD students and the patience of my collaborators were essential for the progress in our dusty plasma research, which has been included in this second edition. Again, many colleagues, journals, and institutions gave kind permission to reproduce figures, which is gratefully acknowledged. My thanks go to Thorsten Schneider and the entire Springer team for encouragement and professional preparation of this edition.

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Plasma Physics

An Introduction to Laboratory, Space, and Fusion

Plasmas

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2017, XX, 463 p. 268 illus., 39 illus. in color., Hardcover

ISBN: 978-3-319-63425-8