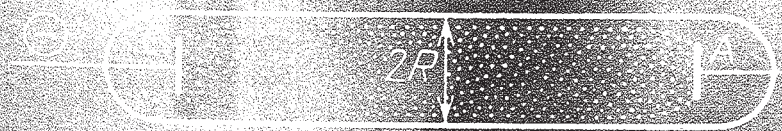


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# Gas Discharge Physics



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Gas Discharge Physics

## Gas Discharge Physics

is both a textbook for beginners and a handbook for specialists in plasma physics and gaseous electronics. The book contains a wealth of useful data: results of experiments and calculations, and reference data. It provides estimates of typical parameters and formulas suitable for computations. Discharges of all important types are described: breakdown, glow, arc, spark and corona, radio frequency, microwave and laser discharges. The interaction between plasmas and electrostatic and electromagnetic fields, low-temperature plasmas, and applications to high-power devices are treated in detail.

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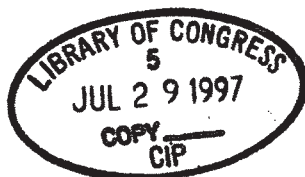
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This edition is based on the original second Russian edition: *Fizika gazovogo razryada*  
© Nauka, Moscow 1987, 1992

1st Edition 1991  
Corrected 2nd Printing 1997

ISBN 3-540-19462-2 Springer-Verlag Berlin Heidelberg New York

Library of Congress Cataloging-in-Publication Data.

Raizer, Ū. P. (Ūrii Petrovich) [Fizika gazovogo razriada. English] Gas discharge physics / Yuri P. Raizer. p. cm. "Corr. printing 1997" - t.p. verso. Includes bibliographical references and index. ISBN 3-540-19462-2 (hardcover: alk. paper) 1. Electric discharges through gases. I. Title. QC711.R22713 1997 537.5'3-dc21 96-53988

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Printed in Germany

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Typesetting: Springer TeX inhouse system  
Cover design: *design & production* GmbH, Heidelberg

SPIN 10565824 54/3144 - 5 4 3 2 1 0 - Printed on acid-free paper

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.R22713  
1997

## Preface

Gas discharges are of interest to physicists and engineers in a number of fields. Several decades ago excellent textbooks were written by von Engel and Steenbeck, Loeb, Brown, Kaptsov and several other authors. These books faithfully served many generations of students, and specialists still refer to them. Nevertheless, their usefulness does suffer from the time elapsed since publication: It is not that the material they present has become obsolete and irrelevant - this has happened to a very minor extent, if at all. Rather, the subject has greatly advanced both in scope and in depth, and its emphases have somewhat shifted. Of course, new books have been written, mostly monographs devoted to narrow branches of gas discharge physics. But these books are typically intended for the specialist and not so much for the novice in the field.

The need for a new textbook that is understandable to a beginner in gas discharge physics, and that conveys the right *amount* of information (even more important: information of the right *kind*) making it also useful to the specialist is apparent. With this in mind, our intention has been to produce a book that serves both as a textbook and a handbook.

From an immense amount of material we have selected, as best we could, the parts that are required for an understanding of the physics and those points that are most frequently needed in research. As a convenient and comprehensive volume, the book contains a maximum of useful data: experimental results, results of calculations, and reference data; formulas required for estimates have been reduced to a form suitable for computations.

This work was published in Russian in 1987 as a substantially larger volume. The English edition has been abridged at the expense of ancillary material concerning collisions, elementary processes, plasma radiation, plasma diagnostics, and other topics, though the chapters dealing with the central themes of discharge physics are retained in full, and even expanded by the addition of new data.

We have decided not to cover actual circuits, techniques, or methods (we will cover the ideas, though) of experiments and measurements; instead we concentrate on the physics of the processes of interest. Purely technical applications of gas discharges are not discussed for the same reason.

It would be impossible to give a comprehensive bibliography when covering such an immensely wide scope of topics; hence, original papers are cited only when recent results are discussed. In all other cases we refer to a book or review paper where more complete references are given.

The author is deeply grateful to Professors A. V. Eletsky and L. D. Tsendin, who read the Russian version of the manuscript, and Professor J. E. Allen, who read the English, for a number of useful comments. In addition, the author would like to thank the translator, Dr. V. I. Kisin, for a fruitful collaboration.

Moscow, April 1991

*Yu. P. Raizer*

## Contents

<b>1. Introduction</b> .....	1
1.1 What Is the Subject of Gas Discharge Physics .....	1
1.2 Typical Discharges in a Constant Electric Field .....	1
1.3 Classification of Discharges .....	3
1.4 Brief History of Electric Discharge Research .....	4
1.5 Organization of the Book. Bibliography .....	6
<b>2. Drift, Energy and Diffusion of Charged Particles in Constant Fields</b> .....	8
2.1 Drift of Electrons in a Weakly Ionized Gas .....	8
2.2 Conduction of Ionized Gas .....	13
2.3 Electron Energy .....	14
2.4 Diffusion of Electrons .....	20
2.5 Ions .....	23
2.6 Ambipolar Diffusion .....	28
2.7 Electric Current in Plasma in the Presence of Longitudinal Gradients of Charge Density .....	30
2.8 Hydrodynamic Description of Electrons .....	33
<b>3. Interaction of Electrons in an Ionized Gas with Oscillating Electric Field and Electromagnetic Waves</b> ....	35
3.1 The Motion of Electrons in Oscillating Fields .....	35
3.2 Electron Energy .....	37
3.3 Basic Equations of Electrodynamics of Continuous Media ...	41
3.4 High-Frequency Conductivity and Dielectric Permittivity of Plasma .....	43
3.5 Propagation of Electromagnetic Waves in Plasmas .....	45
3.6 Total Reflection of Electromagnetic Waves from Plasma and Plasma Oscillations .....	49
<b>4. Production and Decay of Charged Particles</b> .....	52
4.1 Electron Impact Ionization in a Constant Field .....	52
4.2 Other Ionization Mechanisms .....	57
4.3 Bulk Recombination .....	60

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