THE HIGH-PRESSURE SODIUM LAMP

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Preface

The purpose of this book is to outline the principles on which the design of high-pressure sodium discharge lamps is based and to leave the reader with a better understanding of both the background to and the application of these principles.

The book is addressed to research workers, students and development engineers engaged in the study of gas discharges in general and high-pressure sodium discharges in particular.

The emphasis throughout is on the physical aspects of the discharge, concentrating in the main on work carried out in the seventies and the early eighties. This work followed on from the early development work on lamp materials that took place in the beginning of the sixties. The renewed interest in the chemical and technological aspects of the high-pressure sodium discharge lamp coincides with the current development of low-wattage and improved-colour lamps. Because these aspects are still in the development stage, they have been covered somewhat less extensively. An exhaustive treatment of the applications open to the high-pressure sodium lamp is outside the scope of this book.

Chapter 1 provides an introduction to the high-pressure sodium lamp and examines its most important basic features in comparison with other discharge lamps.

Chapter 2 deals in general terms with the power balances and spectra of typical high-pressure sodium lamps and so provides an insight into the energy conversion and the luminous efficacy aspects of these lamps.

High-pressure sodium lamps are generally based on a discharge in a mixture of sodium, mercury and xenon, and this makes a theoretical description rather difficult. To simplify matters, therefore, a high-pressure sodium discharge without these buffer gases is first considered. The spectrum and the power balance of such a so-called pure sodium discharge are discussed in more detail in Chapter 3 and 4 respectively.

In Chapter 5 attention is centred on the influence that the buffer gases mercury and xenon have on the field strength, plasma temperature, radiant power and spectrum of a high-pressure sodium discharge.

Chapter 6 deals with the ignition of the HPS lamp and its stabilisation on

the usual 50 Hz mains-frequency supply. The special cases for high-frequency and pulse current operation are treated in Chapter 7.

Chapters 8 and 9 examine the general properties of the discharge-tube material, the ceramic-to-metal seal and the electrodes.

Finally, Chapter 10 provides guidance on lamp design, the material presented in the earlier chapters being used to shape a design approach.

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J.A.J.M. van Vliet

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