

Preface to the English Edition

Colors arise only in the brain, normally originating from electromagnetic waves from the outside world.

This book is based on courses given by the author in the Department of Colors, Paints and Plastics at the University of Applied Sciences in Stuttgart and continued at the University of Applied Sciences in Esslingen, Germany. The development of color physics in industry began in the middle of the 19th century with the large-scale manufacturing of natural colors. Since that time, a great variety of new, especially synthetic, colorants have been produced in order to meet increasing demands for non-self-luminous colors with regard to color applications. The rapid progress in color physics and accompanying applications over the last three decades are the reasons for this work. Here, the fundamentals of color physics are outlined and the most important recent developments and applications in the color industry are discussed.

In comparison to the first German edition,¹ all chapters of the book have been revised and expanded with regard to effect pigments. After the introductory chapter, the optical fundamentals of absorbing and effect colorants are discussed. The exceptional spectral and colorimetric properties of effect pigments are detailed in combination with further characterizing parameters. Color spaces are presented as well as the efficiency of recent color difference formulas. In addition to the normal spectral measuring methods for absorbing colorants, modified procedures for effect colorations are outlined. The typical angle-dependent properties of pearlescent, interference, and diffraction pigments as well as mixtures with metallic pigments are clarified by measurements. In addition, criteria for estimation of measurement errors as well as the statistics of color difference values are detailed.

¹ Klein, G.A.: “Farbenphysik für industrielle Anwendungen”, Springer, Berlin, Heidelberg (2004).

The directional two-flux approximation with directional rays is introduced and allows for the creation of the optical triangle. Some characteristic triangle parameters enable the demonstration of the performance of the two-, three-, and multi-flux approximations up to a maximum of $n = 256$ fluxes. Based on these different concepts, the fundamentals of the classical color recipe prediction methods are described. These topics are completed with the most important modern methods for recipe prediction for all known sorts of colorations.

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