

PIGMENT HANDBOOK

Volume I

PROPERTIES AND ECONOMICS

Second Edition

Edited by

PETER A. LEWIS

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藏书章

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Preface

This second edition of *Pigments Handbook*, Volume I, is a continuation of the work compiled originally by Temple C. Patton. It is the work of no one person, but is rather the compilation of knowledge and expertise from worldwide authorities in the pigment industry. Through it the reader can obtain an understanding of such topics as the physical and chemical meaning of color, the worldwide market for pigments, the essentials of each pigment's manufacturing or extraction process, and the properties and major reasons for use of each of the pigments covered.

By design, the second edition is not merely an update of the earlier edition. Obviously, new data have been added to update figures originally provided in the 1973 volume. In addition, the reader will find chapters on novel organic and inorganic pigments that were not even at the research stage when the 1973 volume was published.

Furthermore, there are some pigments and classes of pigments that no longer occupy a large enough place in the market or whose usage has been totally discontinued and so are not featured in the second edition.

The majority of chapters include a new and unique section concerning the effect of the pigment on health and the environment. To many, this section will have special significance in light of the varied legislated standards that today's pigment manufacturer and pigment consumer must satisfy. This second edition of Volume I, *Properties and Economics*, is complemented by Volume II, *Applications and Markets*, and Volume III, *Characterization and Physical Relationships*.

PETER A. LEWIS

Cincinnati, Ohio
October 1987

Introductory Notes

DEFINITION OF A PIGMENT

Fundamental to the understanding of this volume is an appreciation of just what defines a pigment. Most definitely a pigment is not a dyestuff. The Dry Color Manufacturers Association (DCMA) has prepared a legally accepted definition of a pigment. Essentially, the DCMA defines a pigment as a colored, black, white, or fluorescent particulate organic or inorganic solid which is usually insoluble in, and essentially physically and chemically unaffected by, the vehicle or substrate into which it is incorporated. A pigment will alter appearance by selective absorption and/or by scattering of light. The pigment is usually dispersed in a vehicle or substrate for application as, for example, in the manufacture of paints, plastics, or other polymeric materials and inks. The pigment will retain its own unique crystalline or particulate structure throughout the incorporation process.

By contrast, dyestuffs essentially are soluble in the carrying medium and therefore any crystalline features are lost in solution when a dyestuff is used to impart color to a material.

FASTNESS PROPERTIES

Within each chapter the lightfastness and bleed-resistant characteristics of each pigment are described using the numerical rating as proposed by both British Standard Specification (BSS) and Deutsche Industrie Norm (DIN) standards.

Lightfastness is a logarithmic measurement, assessed on a scale of 1–8, based on the Blue Wool Scale and may be compared as follows:

Blue Wool Scale Rating	Description	Time to Fade to Grey Scale 3 (hours)
8	Outstanding	>200
7	Excellent	100–200
6	Very good	50–100
5	Good	30–50
4	Satisfactory	20–30
3	Fair	8–20
2	Moderate	3–8
1	Poor	1–3

Figures given are for a Carbon Arc Fadeometer and will vary depending on the influence of the system into which the pigment is incorporated. It is essential that any equipment used to measure lightfastness be calibrated periodically using the standard Blue Wool Scale swatches (B.S. 1006).

Bleed resistance is also a logarithmic scale and is assessed on a scale of 1–5 as follows:

Rating	Description	Observed Change
5	Excellent	No distinguishable discoloration
4	Very good	Very slight discoloration
3	Good	Some discoloration
2	Fair	Marked discoloration
1	Poor	Significant discoloration

It is of particular importance, for comparison purposes, that any bleed tests be standardized with respect to solvent quality, temperature, duration, quantity of pigment taken for test, and conditions of the test, for example, static or dynamic.

Acknowledgments

As editor-in-chief of the second edition of *Pigment Handbook*, I would first like to express my sincere appreciation to Temple C. Patton, editor-in-chief of the original work, which appeared in 1973. Without the pioneering work done by Dr. Patton, this revision would have been an even greater task. Dr. Patton established the structure around which I have provided new and current information.

I would also like to express my thanks to the legion of contributors from around the world who have given freely of their time and shared their expertise in contributing to the second edition.

Mention must also be made of the pigment companies, both small and large, national and multinational, that have donated their resources in terms of time and infor-

mation. The result is that this revision is truly a compendium of the worldwide expertise available within the pigment manufacturing industry.

Special thanks are due to my colleagues within Sun Chemical Corporation for their assistance in the sections that I wrote. In this context, Cindy Jones deserves a particular mention for her assistance in retyping heavily edited manuscripts.

Last, but not least, I must express my appreciation to my wife, Sue, and my daughter, Sharon, for their patience and understanding during many a "lost" summer weekend and for the endless cups of coffee and tea provided during my hours at the word processor.

P. A. L.

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