
Preface

Paints are a ubiquitous and essential part of our everyday lives. One important role they play is to alter or improve the appearance of an object. There are a number of appearance attributes that coatings confer, including color, gloss, distinctness of image, sheen, opacity, and the like. In this book we focus on the opacity of paints, specifically on white hide.

Opacity can come from two sources, either alone or together. They are light absorption and light scattering. Both of these optical phenomena prevent light from penetrating to the substrate surface and then returning to our eye, but they do so in very different ways. Light absorption removes the light all together, resulting in a black paint. Scattering, on the other hand, ideally redirects all of the light out of the paint film before it can penetrate as far as the substrate surface, resulting in a white paint.

The scattering interactions between light and particles are of paramount importance to the Coatings Industry. However, the only mention of light in the curriculum of many universities is as a theoretical construct based on wave equations. Scattering is given a mere footnote, if mentioned at all.

The intent of this book is to provide a detailed explanation of light scattering and white opacity in a way that is useful to the coatings formulator. While some concepts covered here date back a century or more, they have not yet, to the author's knowledge, been assembled in one place. It is the specific goal of this book to provide a reference both for those new to the field of Coatings Science as well as longtime practitioners of the art.

This book approaches light scattering from both a theoretical and a practical view point. The first two chapters describe the physical phenomenon of light scattering, first by a single particle and then by an ensemble of particles. Chapter 1 is the most theoretical in the book, and those readers less inclined to theory can skip all but the summary and still follow the remaining chapters. After discussing the phenomenon of light scattering, the book turns to the practical aspects of formulating a paint with high opacity. A chapter is given on measuring white opacity, followed by a number of chapters' detailing factors that affect light-scattering strength in a paint film. The book concludes with a discussion on cost reduction using the principles covered in previous chapters.

A list of references can be found at the end of each chapter. In general, these are the first reports of important concepts or results, rather than the most recent

paper on the subject. There are three reasons for this—first, due to the high level of research activity going on in the coatings industry, a list of the most recent references would be obsolete very soon after publication of this book. Second, the initial report is nearly always the most complete in terms of describing a new concept and its underlying fundamentals. Finally, with the ease of electronic searches available today, it is trivial for a researcher to find the most recent papers that reference back to these original reports, whereas following the paper trail backward poses more of a difficulty.

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A User's Guide

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