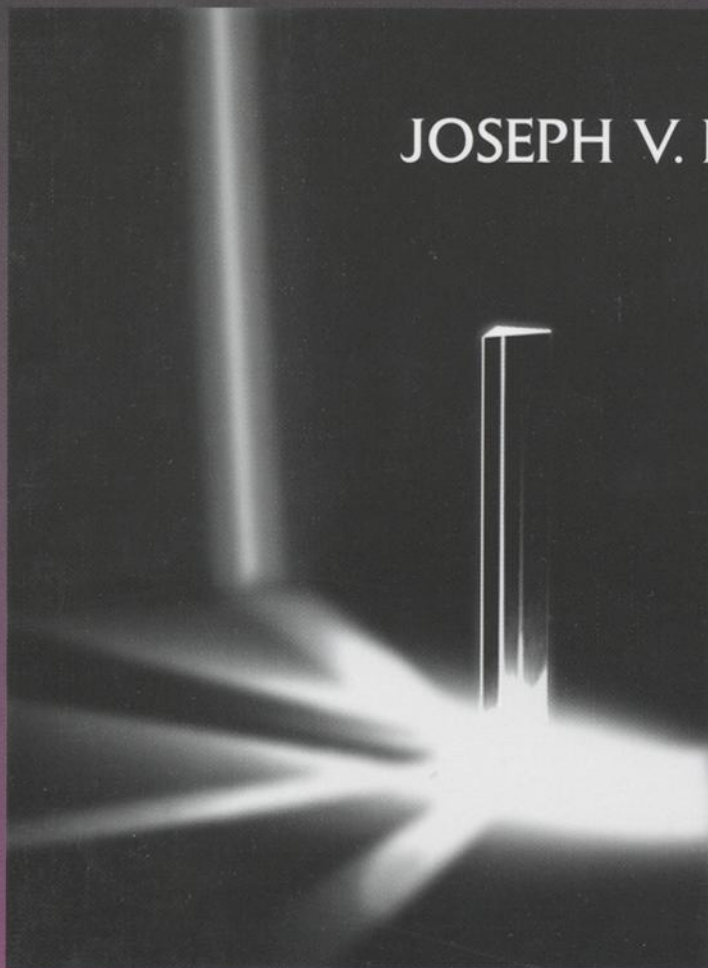


# RADIATION CURING OF COATINGS

JOSEPH V. KOLESKE



# Radiation Curing of Coatings

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NOTE: This manual does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this manual to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

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# Foreword

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THIS PUBLICATION, *Radiation Curing of Coatings*, was sponsored by Committee D01 on Paint and Related Coatings, Materials, and Applications. This is Manual 45 in ASTM International's manual series.

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# Preface

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IMAGINE PLACING a layer of a low viscosity liquid mixture made up of monomeric and oligomeric compounds on a substrate, shining a beam of ultraviolet radiation on the liquid, and then in less time than it takes to snap your fingers—effectively, instantaneously—having the entire liquid mass turn into a solid, cross-linked, hard, tough coating with both functional and decorative properties. Sound impossible? Sound magical—like Mary Poppins (to the older generation) or the X-Files (to the younger or younger thinking generation)? Certainly it does! It sounds too good to be true, or as if it were magical in nature. However, it is merely a brief, popularized description of the coating technology known as “radiation curing” or the more limiting term, “photocuring.” This technology that deals with using the substrate as your polymerization vessel will be described in detail, but in an understandable manner, in this book. Reading it will give one a good understanding of this topic and enough knowledge to begin formulating radiation-curable inks, coatings, and sealants.





## ABOUT THE AUTHOR

DR. JOSEPH V. KOLESKE is a Senior Consultant for Consolidated Research, Inc., and free-lance technical writer in Charleston, West Virginia. He has served in this capacity for 14 years. Prior to this position, he was a Corporate Research Fellow at Union Carbide Corporation in South Charleston, West Virginia for 25 years. In his career, he has worked in the areas of radiation-curable, powder, and high-solids coatings; material science; and solution properties of polymers, fibers, and polyurethanes.

He lectures about radiation-cured coatings during the annual summer coatings short course at North Dakota State University.

He serves on the Editorial Review Board of the *Journal of Coatings Technology* and is a Contributing Editor for *Paint & Coatings Industry Magazine*.

Dr. Koleske is the editor of ASTM International's *Paint and Coating Testing Manual: Fourteenth Edition of the Gardner-Sward Handbook*.

He holds 89 U.S. patents in the above fields, with 30 of them related to radiation-cured coatings. He is the author or coauthor of 107 journal articles and book chapters, with 30 of them related to radiation-cured coatings. Authored monographs include *Free Radical Radiation Curing*, 1997, and *Cationic Radiation Curing*, 1991, *Federation of Societies for Coatings Technology*, Blue Bell, PA. Coauthored books include *Alkylene Oxides and Their Polymers*, Marcel Dekker Inc., New York, 1990; *Poly(ethylene oxide)*, Academic Press, New York, 1976; and *Poly(vinyl chloride)*, Gordon & Breach, New York, 1969.

Dr. Koleske received his B.S. degree in chemical engineering from the University of Wisconsin-Madison and M.S. and Ph.D. degrees from the Institute of Paper Chemistry, Lawrence College, Appleton, Wisconsin.

## RELATED ASTM INTERNATIONAL PUBLICATIONS

### ASTM Standards Related to TESTING OF RADIATION CURED COATINGS

These ASTM standards are often used and referenced in the radiation-curing industry. Some are used in coating chemistries and others are specifically designed for radiation-cured products. The standards are arranged alphanumerically and listed by subject area. This is a must have reference book for technologists and an excellent companion to *Radiation Curing of Coatings*.

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### PAINT AND COATING TESTING MANUAL:

*Fourteenth Edition of the Gardner-Sward Handbook* Joseph V. Koleske, Editor

A valuable guide to the topics, test methods, procedures, and standards of ASTM International and other national and international organizations. This 925-page hard cover book describes test methods that are significant in the world of paint technology. Seventy-eight chapters written by experts in their various fields cover: current industry regulations; the main polymeric species, colorants, special pigments, extenders, and additives used in the coating industry; analyses used to dissect and analyze a coating; instruments used in the industry; products and how they are used and tested.

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