

Preface

This book is based on a series of continuing education courses which have been offered by the authors across the world in conjunction with the International Symposium on Plasma Chemistry (ISPC) as part of its summer school over the period 1995–2011. A similar course, though more oriented toward thermal spray technology, was also offered by the authors in conjunction with ASM International Thermal Spray Conferences (ITSC) over the period 1998–2010. Both courses were offered to graduate students, practicing engineers, and researchers actively involved in the field of thermal plasmas. Their emphasis was on the fundamentals behind plasma processing and thermal spray technology, and the aim was to provide a grassroot understanding of the basic phenomena involved, necessary for taking the technology over the crucial step from being an “art” based on operator talent and experience to a mature science with quantitative predictive capabilities.

This step did not come easily and without the intense involvement of many leading researchers in this field across the world. The three determining factors which were of critical importance to the evolution of this field over the past three decades are as follows:

- Major improvement in process diagnostics and online controls
- The fast and significant development of numerical modeling and computing capabilities
- Major development in materials science and materials characterization techniques

In the process of preparation of the manuscript for this book, which spans many years, the authors were confronted with the critical need to strike a good balance between the need to be concise in the overall presentation of the subject and being inclusive in stressing the fundamentals without overlooking the important applications which were the economical driver of the technology. New technologies were also developed over this period which, while not being “plasma technologies,” were relevant to the overall field of surface treatment and coating. These were accordingly included in the book such as the combustion-based technologies and “cold spray.”

We have no pretensions about having covered every aspect of this technology or exhaustively reported on every relevant publication in this field. Exhaustive lists of references are given at the end of each chapter. For those who were not cited, our apologies, it was not intentional. A book of this size and scope could not have been possible without the extensive help of students, research assistants, colleagues, and associates. Our sincere thanks to all who have helped make this book a reality. Particular thanks are due to Dr. Rudolf Henne who so generously gave his time in the process of reviewing the manuscript of the book in its final preparation stage. We also appreciate his willingness to write the foreword for this book which reflects his long and broad experience in the field of thermal spray. The financial assistance of the numerous government and private funding agencies and industrial partners who have also supported the basic and applied research behind this technology in our respective research laboratories is gratefully acknowledged. Our sincere thanks to our respective families and life partners, Paulette Fauchais, Yuko Heberlein, and Alice Boulos who had to cope with the long hours of intense personal efforts that were needed to complete this book.

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Contents

1	Introduction	1
1.1	Needs for Coatings	1
1.2	Thin Films vs. Thick Films	2
1.3	Thermal Spray Coating Concept	2
1.4	Description of Different Thermal Spray Coating Processes	4
1.5	History of Thermal Spray	7
1.6	Thermal Spray Applications	8
1.7	Overview of Book Content	13
	References	14
2	Overview of Thermal Spray	17
2.1	Surface Treatments or Coatings	17
2.1.1	Why Surface Treatment or Coatings	17
2.1.2	Surface Treatments	18
2.1.3	Coatings	19
2.2	Brief Descriptions of Thermal Spray Applications	25
2.3	Overview of Thermal Spray Processes	27
2.3.1	Compressed Gas Expansion	28
2.3.2	Combustion Spraying	28
2.3.3	Electrical Discharge Plasma Spraying	28
2.4	Substrate Preparation	32
2.5	Energetic Gas Flow Generation	33
2.5.1	Cold Spray	33
2.5.2	Flame Spray	35
2.5.3	High-Velocity Oxy-fuel Spraying	36
2.5.4	Detonation Gun Spraying	38
2.5.5	Direct Current Blown Arc Spraying or d.c. Plasma Spraying	39
2.5.6	Vacuum Induction Plasma Spraying	40
2.5.7	Wire Arc Spraying	42
2.5.8	Plasma-Transferred Arc Deposition	43

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