

Preface

The laser metal deposition process is an important additive manufacturing process that has a great potential of revolutionizing the way products are made and remanufactured. This book starts with the introduction of the laser metal deposition process and a brief background of the process. A detailed introduction of the laser metal deposition process is presented in Chap. 1 of the book. Laser has a number of important characteristics that make its use in the laser metal deposition process an important one. The basics of laser principle are explained in Chap. 2. The characteristics of laser are also described in this chapter. The laser metal deposition process is fully described in Chap. 3. The important processing parameters in the laser metal deposition process are explained in Chap. 4. Laser metal deposition of metals and alloys and the laser metal deposition of composites and functionally graded materials are explained in Chaps. 5 and 6, respectively. The areas of application of the laser metal deposition process are presented in Chap. 7. Case studies on the processing of titanium alloy and titanium alloy composite using the laser metal deposition process are presented in Chap. 8. The research advancements in laser metal deposition process are presented in Chap. 9, while the future research direction and summary are presented in Chap. 10. This book is organized as follows:

Chapter 1—Introduction of laser metal deposition process and a brief background of the process are discussed in this chapter.

Chapter 2—Laser is an important invention that has helped to change the way many things are done these days. Laser is a unique source of light that is highly coherent and highly directional. These important laser characteristics of laser make it possible to control the energy to only the needed area. The basic principle of laser and characteristics of laser are explained in this chapter.

Chapter 3—The full description of the laser metal deposition process is presented in this chapter. The creation of the melt pool and the solidification process that results in the characteristic microstructures during the laser metal deposition process are fully described in this chapter.

Chapter 4—Processing parameters such as laser power, scanning speed, powder flow rate and gas flow rate are very important in the laser metal deposition process.

The influence of each of these processing parameters on the developed materials properties is explained in this chapter.

Chapter 5—A number of materials can be processed using the laser metal deposition process, and this is one of the reasons why this additive manufacturing process is an important one. The laser metal deposition process of metals and alloys is presented in this chapter.

Chapter 6—The flexibility offered by the laser metal deposition process is in its capability to process more than one material at the same time that makes it possible to be able to process composite and functionally graded materials. The use of laser metal deposition process for composite and functionally graded materials is presented in this chapter.

Chapter 7—Laser metal deposition process, like any other additive manufacturing process, can produce three-dimensional object directly from the three-dimensional computer-aided design data of the object by adding materials layer by layer. The laser metal deposition process is also useful in the repair of high-valued parts which cannot be achieved by any other process. The areas of applications of the laser metal deposition process are explained in this chapter.

Chapter 8—Case studies on the laser metal deposition process of titanium alloy and titanium alloy composite and the influence of the processing parameters on the evolving properties of the titanium and titanium alloy are presented in this chapter.

Chapter 9—Progress in terms of research in the laser metal deposition process is presented in this chapter.

Chapter 10 ends the book. The future research direction in the laser metal deposition process and the summary of the whole book are presented in this chapter.

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