



Science and Engineering of Casting Solidification

By Doru Michael Stefanescu

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Casting of metals evolved first as witchcraft, gradually became an art, then technology, and became only recently a science. Many of the processes used in a metal casting are still empirical in nature, but many others are deeply rooted in mathematics. In whatever form, casting of metals is an activity fundamental in the very existence of our world, as we know it today.

Foundry reports indicate that solidification modeling is not only a cost-effective investment but also a major technical asset. It helps foundries move into markets with more complex and technically demanding work. However, to the best of the author's knowledge, there have been no attempts to synthesize the information that can be used for engineering calculations pertinent to computational modeling of casting solidification.

This book is based on the author's thirty years of experience with teaching, research and the industrial practice of solidification science as applied to casting processes. It is an attempt to describe solidification theory through the complex mathematical apparatus that includes partial differential equations and numerical analysis, which are required for a fundamental treatment of the problem. The mathematics, however, is restricted to the element essential to attain a working knowledge of the field. This is in line with the main goal of the book, which is to educate the reader in the fast moving area of computational modeling of solidification of casting. For the sake of completeness, a special effort has been made to introduce the reader to the latest developments in solidification theory, even if the reader has no engineering applications at this time.

The text is designed to be self-contained. The author's teaching experience demonstrates that some of the students interested in solidification science are not

fully proficient in partial differential equations (PDE) and/or numerical analysis. Accordingly, elements of PDE and numerical analysis, required to obtain a working knowledge of computational solidification modeling, have been introduced in the text while attempting to avoid the interruption of the fluency of the subject. Numerous modeling and calculation examples using the Excel spreadsheet as an engineering tool are provided. The book is addressed to graduate students and seniors in solidification science, as well as to industrial researchers who work in the field of solidification in general and casting modeling in particular.

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Editorial Review

From the Back Cover

Science and Engineering of Casting Solidification, Second Edition covers the essentials of solidification science of metals and alloys at macro- and micro-length scales at cooling rates specific to commercial castings and rapid solidification processing. The mathematical fundamentals necessary to build a working knowledge in the field, specifically partial differential equations and numerical analysis, are introduced. Each topic begins with the description of the underlying physics, followed by the mathematics required to build analytical and numerical models. Wherever possible, a detailed description of the architecture of the numerical model is provided, followed by examples of models built on the Excel spreadsheet.

Features of this new edition include:

- Expanded sections on peritectic solidification and shrinkage porosity mechanisms and modeling,
- A new chapter addressing rapid solidification and bulk metallic glasses,
- Additional solved problems,
- Revised and simplified derivations of several models.

Science and Engineering of Casting Solidification, Second Edition will prove useful to senior undergraduate and graduate students, as well as to industrial researchers that work in the field of solidification in general and casting modeling in particular. The detailed coverage of casting defects will also make it useful to industrial practitioners of metal casting. Additional course materials are available upon faculty request.

Users Review

From reader reviews:

Donna Lacher:

Nowadays reading books be a little more than want or need but also become a life style. This reading routine give you lot of advantages. The advantages you got of course the knowledge even the information inside the book this improve your knowledge and information. The knowledge you get based on what kind of book you read, if you want get more knowledge just go with training books but if you want really feel happy read one having theme for entertaining for example comic or novel. Often the Science and Engineering of Casting Solidification is kind of guide which is giving the reader erratic experience.

Nancy Jackson:

Reading a guide can be one of a lot of action that everyone in the world loves. Do you like reading book and so. There are a lot of reasons why people enjoy it. First reading a e-book will give you a lot of new facts. When you read a guide you will get new information since book is one of many ways to share the

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Patrick Pierce:

A lot of people always spent all their free time to vacation or perhaps go to the outside with them household or their friend. Are you aware? Many a lot of people spent these people free time just watching TV, or maybe playing video games all day long. If you want to try to find a new activity honestly, that is look different you can read any book. It is really fun in your case. If you enjoy the book that you simply read you can spent 24 hours a day to reading a book. The book Science and Engineering of Casting Solidification it is quite good to read. There are a lot of folks that recommended this book. These were enjoying reading this book. Should you did not have enough space to create this book you can buy the particular e-book. You can m0ore quickly to read this book from the smart phone. The price is not very costly but this book has high quality.

Micah Clark:

Playing with family inside a park, coming to see the water world or hanging out with close friends is thing that usually you might have done when you have spare time, and then why you don't try factor that really opposite from that. One particular activity that make you not sensation tired but still relaxing, trilling like on roller coaster you are ride on and with addition of information. Even you love Science and Engineering of Casting Solidification, it is possible to enjoy both. It is very good combination right, you still would like to miss it? What kind of hang type is it? Oh seriously its mind hangout guys. What? Still don't understand it, oh come on its known as reading friends.

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