Aluminum-Silicon Casting Alloys

Atlas of Microfractographs

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About the Author

Małgorzata Warmuzek earned her master of science degree at the Academy of Mining and Metallurgy, Kraków, Poland, in physical metallurgy and heat treatment in 1974. She earned her doctorate from the Foundry Research Institute, Kraków, in physical metallurgy and heat treatment in 1981.

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She has authored or coauthored more than 24 papers on the aforementioned topics. Dr. Warmuzek is the author of the article “Metallographic Techniques for Aluminum and Its Alloy” in the revised edition of *Metallography and Microstructures*, Volume 9, *ASM Handbook*, to be published in 2004.
Preface

This atlas of microfractographs—fracture images seen under a microscope, includes both profile and surface views of the specimens, and comprises a systematic documentation of aluminum-silicon alloys with relevant descriptions. The challenges of fractography are discussed in a comprehensive manner. The atlas contains images of fractures obtained during laboratory testing of mechanical properties. A set of images covers hypoeutectic, eutectic, and hypereutectic (mainly permanent mold) cast aluminum-silicon alloys. The surface of fractures visible under high-resolution scanning electron microscopy (SEM) are shown together with subsurface effects on metallographic specimens normal to the fracture plane, observed with light microscopy.

This book also deals with the physical, crystallographic, and microstructural aspects of the formation of aluminum-silicon cast alloys as they relate to mechanical properties. The criteria of fracture classification are established along with a set of the most important data on the morphology of the basic types of fractures that occur in metals used in structures. These may be used as a basis in the classification of fractures and in an assessment of the fracture path, its mechanism, and conclusions on the possible causes of a failure.

The alloys presented in this atlas are commercially important as their high strength-to-weight ratios make them suited for applications where reduction of weight is a design consideration, such as in automobile engine blocks, gear boxes, aerospace castings, and consumer products, as well as in marine and architectural uses.

This book is an English version of the atlas that was published in Poland in 2000. The author wishes to acknowledge her teacher Professor Stanisław Gorczyca, one of the pioneers of electron microscopy in Poland, to whom she is indebted for helping her finding a place in the world of technology. The author wishes to thank George Vander Voort, FASM, who brought this work to the attention of ASM International and Dr. Jerzy Tybulczuk (Foundry Research Institute) for support in the conception of this book.

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