Rapidly Solidified Crystalline Alloys

Edited by S.K. Das, B.H. Kear and C.M. Adam

(The Metallurgical Society, 1986)

This conference proceedings reports contributions to a May 1985 meeting of the Northeast Regional Section of TMS-AIME and cosponsored by the New Jersey Chapter of TMS and by the Materials Research Society. As the first in what has become a cosponsored series of meetings, its program combined the metals and materials flavors of the sponsors. A great many texts and, in particular, conference proceedings cover rapid solidification. However, because it remains an active field where many unanswered questions remain, this book, itself unremarkable, contains valuable information for practitioners in the field. Overviews on processing methods and on RSP alloy microstructures and properties provide perspectives on a range of ferrous and nonferrous systems.

Of particular value are the two lead-off papers by M. Cohen and M. Flemings and by W. Boettinger and J. Perepezko which review the field as a whole and discuss the extension of fundamental considerations implicit in solidification phenomena to the rapid regime. These two papers will serve as valuable introductory material for novices in the field for years to come. Although this book was published in 1986, the overview format ensures its continued value to the RSP community.

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Rapidly Solidified Metals—A Technological Overview

Edited by T.R. Anantharaman and C. Suryanarayana

(Trans Tech Publications, 1987)

In rapid solidification—often abbreviated RSP for Rapid Solidification Processing—the molten alloy is broken up into small droplets, a thin ribbon or other geometries so that heat can be quickly extracted into the surrounding gas or into a solid heat sink; consequently cooling rates exceeding 106 K/s are routinely achieved. Alloys thus solidified have metastably extended solubility ranges for many solutes and ultrafine dispersions of second phases; some alloys solidify as metallic glasses. These characteristics have permitted the creation of a great variety of alloys with unusually favorable mechanical or magnetic properties, and within a few years the technique has become commonplace in advanced metallurgy, especially of steels and light alloys.

In the last few years there have been many books (mostly multi-author volumes) devoted to RSP, especially glass formation, including a sourcebook published by ASM and a specially useful survey of RSP crystalline alloys published by TMS-AIME in 1986. The new book under review is an excellent 260-page outline of the whole field. Its principal distinction is a magnificent survey of the varied production techniques, the most comprehensive and up-to-date treatment known to the reviewer. The authors, Indian academic metallurgists, who are experienced both working in the field and writing surveys and bibliographies, have produced not only a fine description of techniques but also a relevant list of references up to 1986. Likewise there is a concise overview of RSP alloys applications, especially up to date on magnetic uses. The bibliographies of all the chapters (except that on the science of metallic glasses) are thorough, and a comprehensive list of secondary sources is included.

The treatment of microcrystalline particular alloy families (steels, aluminum, titanium and other alloys, and glasses) is also sound, though in parts, especially the aluminum alloys, more compressed than one might have wished. A short chapter on quasicrystals seems out of tune with all the rest, being pure science and no technology (quasicrystals have no technology!). However, the inclusion of this chapter can be justified in terms of the disproportionate contribution made by Indian metallurgists to the study of these curious entities.

The book is printed from good camera-ready copy and, for once, the potentiality for rapid publication of this technique has been realized. The style is clear, though there is an occasional tendency to gee-whizzery, due no doubt to the authors' enthusiasm for their subject.

A good value for the money, this book is recommended as a fine source book.

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Semiconductor Materials and Process Technology Handbook

Edited by Gary E. McGuire, Noyes Publications, 1988

With the rapid evolution in silicon process technology, maintaining awareness in all aspects of device processing is difficult. At first glance, this handbook appears to solve this problem. Ten chapters cover the critical process areas in Very Large Scale Integration (VLSI) and Ultra Large Scale Integration (ULSI) technology, and each chapter was written by a recognized authority.

The book is organized logically, going from the silicon materials through the process steps required to realize an integrated circuit, with the final chapter discussing the techniques used for materials characterization. Each chapter provides basic background information. In particular, Chapter 7 gives an excellent review of impurity diffusion in silicon while chapter 4 provides a useful summary of orientation dependent etching. Overall, the information provided was too general to be useful and not current with the state of the art.

Few references are noted after 1985 and several important process developments are excluded. Among these are rapid thermal processing for impurity activation and silicon oxidation/nitridization; chemical vapor deposition of refractory materials, particularly selective tungsten process; and low pressure silicon epitaxial growth.

This volume is of limited value to workers in the field as a technical source, falling short of the expectations raised by the title. By attempting to meet the needs of both the experienced engineer and the newcomer to silicon process technology, it achieves neither very well.

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