Photoacoustic and Photothermal Phenomena

Edited by P. Hess and J. Pelzl
(Springer-Verlag, 1988)

This book represents the proceedings of the Fifth International Topical Meeting on Photoacoustics and Photothermal Phenomena, held at the University of Heidelberg, July 27-30, 1987.

As with the previous biennial meetings on this topic, this conference was well attended by researchers representing many different countries and diverse areas of interest. The major topics include spectroscopy, kinetics and relaxation, trace analysis, surfaces and thin films, applications to semiconductors, ultrasonic detection and characterization, mass and heat transfer, thermal wave nondestructive evaluation, experimental techniques, and biological and medical applications.

In many of these areas, researchers reported significant advances since the last meeting two years ago. Some of these include photoacoustic spectroscopy experiments with x-ray and synchrotron sources, the merging of photoacoustic and thermal lens techniques for kinetic studies, pulsed thermal wave experiments ranging from the microsecond to the nanosecond temporal regime for the study of surfaces and thin films, investigations of surface and interface semiconductor states, various applications of thermal wave imaging methods for problems in QNDE, advances in pyroelectric and photothermal detection methodologies, and further understanding of photoacoustic studies in photosynthetic biological systems.

The 155 papers reproduced in this volume range from review articles that would be useful to researchers unfamiliar with this field to timely research reports that provide thermal wave scientists with important new data and concepts. These proceedings should thus be of interest to a wide audience.

The editors and publisher have done a commendable job in presenting the material clearly and cohesively, a formidable task indeed when reporting on the diverse activities in such a broad cross-disciplinary field.

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Welding Metallurgy of Stainless Steels

Erich Folkhard in collaboration with Günther Rabensteiner, Ernst Perteneder, Heinz Schabereiter, and Josef Tösch

(Springer-Verlag, 1988)

Welding engineers and metallurgists who have relied for nearly two decades on Castro and de Cadenet's *Welding Metallurgy of Stainless and Heat-Resisting Steels* now have available to them an updated text on stainless steel welding metallurgy—a recently revised English translation of *Metallurgie der Scheissung nichtrostender Stahle (Welding Metallurgy of Stainless Steels)* by Erich Folkhard. The book was prepared in collaboration with Günther Rabensteiner and his colleagues at the Böhler Welding Division in Kapfenburg, Austria. The original German text, published in 1984, has been updated and "Americanized" to reflect U.S. materials designations and standards.

The text is organized in the fashion of its predecessor, containing introductory sections on various general aspects of stainless steel metallurgy followed by sections addressing specific alloy classes. Folkhard expanded these introductory sections to reflect the large body of information published since Castro and de Cadenet's last version in 1972. Folkhard cites 487 references while Castro and de Cadenet cite only 85. Nearly two-thirds of the book is dedicated to a general treatment of stainless steel welding metallurgy and is spiced with practical examples gleaned from the literature. These sections cover the use of constitution diagrams, solidification behavior, solid-state transformations, precipitation behavior, and weld solidification cracking. The last third of the book contains more detailed information on specific classes of stainless steels, including sections on ferritic, martensitic, austenitic, and duplex (austenitic-ferritic) steels.

A strong point is the book's presentation and treatment of binary and ternary equilibrium phase diagrams as a means to predict elemental effects on solidification behavior and phase stability in stainless steel welds. Due to the nonequilibrium nature of solidification and transformation behavior in welds, the discussion is more generally applicable to stainless-steel-based materials but contains references to weld metal and heat-affected zone (HAZ) structures where appropriate. The treatment of precipitation phenomena in stainless steels and weld metals is extensive and provides a comprehensive review of carbide and sigma-phase precipitation and the influence of these precipitation phenomena on corrosion behavior and mechanical properties.

Perhaps the most notable contribution of Folkhard's text is the treatment of weld solidification behavior and cracking in austenitic stainless steels. Castro and de Cadenet's book is now particularly outdated on these topics. For example, the relationship between the primary phase of solidification and weld solidification cracking resistance was not recognized then. The solidification section is accompanied by several color photomicrographs that clearly describe the primary solidification behavior of the austenitic stainless steels.

Despite obvious improvements over previous texts, *Welding Metallurgy of Stainless Steels* is a bit of a misnomer since not all classes of stainless steel are addressed. There is essentially no treatment of the precipitation-hardenable, nitrogen-strengthened or cast stainless steels. Discussion is heavily biased toward the austenitic stainless steels, with nearly the same amount of space devoted to this alloy class as to the ferritic, martensitic, and duplex classes combined. Castro and de Cadenet's treatment of the ferritic, martensitic and age-hardenable grades, although slightly outdated, provides much valuable information not found in Folkhard's book.

Although Folkhard has done a good job describing many of the cracking mechanisms associated with stainless steel welds, there is no mention of copper-contamination cracking nor is there reference to the low temperature sensitization (LTS) phenomena that has plagued many weld HAZs in austenitic stainless steels. The treatment of ferrite measurement and prediction is adequate but limited and does not consider the influence of high weld cooling rates on ferrite content and solidification behavior. A section on weld hot cracking tests is limited in scope and was apparently added to introduce a test technique developed by the authors (the PVR Test).

Welding Metallurgy of Stainless Steels provides engineers and metallurgists with a good reference text that successfully summarizes most of the significant research results since publication of Castro and de Cadenet's *Welding Metallurgy of Stainless and Heat-Resisting Steels*. The book is probably most valuable as a reference text, but may be appropriate as a classroom text in advanced degree curricula. It is an excellent companion to Castro and de Cadenet's earlier work and should soon find its way onto many welding engineers' and metallurgists' bookshelves.

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