Stainless Steel Cladding And Weld Overlays Asm International

Thermal aging of three-wire series-arc stainless steel weld overlay cladding at 288°C for 1605 h resulted in an appreciable decrease (16%) in the Charpy V-notch (CVN) upper-shelf energy (USE), but the effect on the 41-J transition temperature shift was very small (3°C). The combined effect following neutron irradiation at 288°C to a fluence of 5 x 1019 neutrons/cm2 (>1 MeV) was a 22% reduction in the USE and a 29°C shift in the 41-J transition temperature. The effect of thermal aging on tensile properties was very small. However, the combined effect of irradiation and aging was an increase in the yield strength (6 to 34% at test temperatures from 288 to -125°C) and no apparent change in ultimate tensile strength or total elongation. Neutron irradiation reduced the initiation fracture toughness (JIc) much more than did thermal aging alone. However, irradiation slightly decreased the tearing modulus but no reduction was caused by thermal aging alone. The effects of long-term thermal exposure times (20,000 and 50,000 h) will be investigated when the specimens become available. Also, long-term thermal exposure of the three-wire cladding as well as type 308 stainless steel weld materials at 343°C is in progress.

This report describes in some detail the practical aspects of the explosive-bonding process, including basic mechanics of the process, practices of those in the field, metal combinations that have been bonded, and applications of explosively bonded products. Methods of testing joints produced by explosive bonding are described. An exhaustive list of metal combinations which have been explosively-bonded is included in the report. (Author).

"This comprehensive reference covers all the important aspects of heat exchangers (HEs)--their design and modes of operation--and practical, large-scale applications in process, power, petroleum, transport, air conditioning, refrigeration, cryogenics, heat recovery, energy, and other industries. Reflecting the author's extensive practical experienc

This monograph is a first-of-its-kind compilation on high deposition pulse current GMAW process. The nine chapters of this monograph may serve as a comprehensive knowledge tool to use advanced welding engineering in prospective applications. The contents of this book will prove useful to the shop floor welding engineer in handling this otherwise critical welding process with confidence. It will also serve to inspire researchers to think critically on more versatile applications of the unique nature of pulse current in GMAW process to develop cutting edge welding technology.

ASM Specialty Handbook® Stainless Steels The best single-volume reference on the metallurgy, selection, processing, performance, and evaluation of stainless steels, incorporating essential information culled from across the ASM Handbook series. Includes additional data and reference information carefully selected and adapted from other authoritative ASM sources.

The possibility of stainless steel cladding increasing the resistance of an operating nuclear reactor pressure vessel to extension of surface flaws is highly dependent upon the irradiated properties of the cladding. Therefore, weld overlay cladding irradiated at temperatures and fluences relevant to power reactor operation was examined. The cladding was applied to a pressure vessel steel plate by the submerged-arc, single-wire, oscillating electrode method. Three layers of cladding were applied to provide a cladding thickness adequate for fabrication of test specimens. The first layer was type 309, and the upper two layers were type 308 stainless steel. There was considerable dilution of the type

309 in the first layer of cladding as a result of excessive melting of the base plate. Specimens for the irradiation study were taken from near the base plate/cladding interface and also from the upper layers of cladding. Charpy V-notch and tensile specimens were irradiated at 288°C to neutron fluences of 2 x 1023 n/m2 (E> 1 MeV). When irradiated, both types 308 and 309 cladding showed a 5 to 40% increase in yield strength accompanied by a slight increase in ductility in the temperature range from 25 to 288°C. All cladding exhibited ductile-to-brittle transition behavior during impact testing.

Corrosion failures of industrial components are commonly associated with welding. The reasons are many and varied. For example, welding may reduce the resistance to corrosion and environmentally assisted cracking by altering composition and microstructure, modifying mechanical properties, introducing residual stress, and creating physical defects. This book details the many forms of weld corrosion and the methods used to minimize weld corrosion. Chapters on specific alloys groups--carbon and alloy steels, stainless steels, high-nickel alloys, and nonferrous alloys--describe both general welding characteristics and the metallurgical factors that influence corrosion behavior. Corrosion problems associated with dissimilar metal weldments are also examined. Case histories document corrosion problems unique to specific industries including oil and gas, chemical processing, pulp and paper, and electric power. Special challenges caused by high-temperature environments are discussed. Commonly used methods to monitor weld corrosion and test methods for evaluation of intergranular, pitting, crevice, stress-corrosion cracking, and other forms of corrosion are also reviewed.

When considering the operational performance of stainless steel weldments the most important points to consider are corrosion resistance, weld metal mechanical properties and the integrity ofthe weldedjoint. Mechanical and corrosion resistance properties are greatly influenced by the metallurgical processes that occur during welding or during heat treatment of welded components. This book is aimed, there fore, at providing information on the metallurgical problems that may be encountered during stainless steel welding. In this way we aim to help overcome a certain degree of insecurity that is often encountered in welding shops engaged in the welding of stainless steels and is often the cause of welding problems which may in some instances lead to the premature failure of the welded component. The metallurgical processes that occur during the welding of stainless steel are of a highly intricate nature. The present book focuses in particular on the signif icance of constitution diagrams, on the processes occurring during the solidification of weld metal and on the recrystallization and precipitation phenomena which take place in the area of the welds. There are specific chapters covering the hot cracking resistance during welding and the practical welding of a number of different stainless steel grades. In addition, recommendations are given as to the most suitable procedures to be followed in order to obtain maximum corrosion resistance and mechanical properties from the weldments.

The History of Stainless Steel provides a fascinating glimpse into a vital material that we may take for granted today. Stainless steel, called "the miracle metal" and "the crowning achievement of metallurgy" by the prominent metallurgist Carl Zapffe, is a material marvel with an equally fascinating history of people, places, and technology. As stainless steel nears the hundredth anniversary of its discovery, The History of Stainless Steel by Harold Cobb is a fitting perspective on a vital material of our modern life. Aptly called the miracle metal by the renowned metallurgist Carl Zapffe, stainless steel is not only a metallurgical marvel, but its history provides an equally fascinating story of curiosity, competitive persistence, and entrepreneurial spirit. The History of Stainless Steel is the world's first book that captures the unfolding excitement and innovations of stainless steel pioneers and entrepreneurs. Many new insights are given into the work of famous pioneers like Harry Brearley, Elwood Haynes, and Benno Strauss, including significant technical contributions of lesser known figures like William Krivsky. This fascinating history of stainless steel exemplifies the great push of progress in the 20th Century. From the stainless steel cutlery of Brearley in 1913, stainless steel burst on the modern scene in many tangible ways. Excerpted text by William Van Alen, architect of the Chrysler Building, describes the early architectural use of stainless steel. Another historic application of stainless steel is the revolution in rail travel by the Edward G. Budd Company, which built the first light-weight stainless steel passenger trains--with an astounding 90% reduction in fuel costs. This remains recognized today as one of the technological marvels of the modern world. Harold Cobb, a metallurgist who has spent much of his career in the stainless steel industry, uncovers many interesting stories and insights, including a special perspective on the prominent role of stainless steel in the activities of emerging technical societies such as the American Society for Metals and the American Society for Testing and Materials. Amply illustrated and with a 78-page timeline, this publication truly evokes the inspirations created by and from stainless steel.

The use of tubular, or as it is often known, flux-cored wire has grown dramatically in the last thirty years. It is a versatile and productive weld material with wide applications. Yet this book is the first to provide fabricators with a comprehensive and unvarnished account of what tubular wires can do and how they do it. Based on the author's fifteen years' experience of developing and applying tubular wires, it brings together information not previously available in one place, some of which has never been published.

The most up-to-date coverage of welding metallurgy aspects and weldability issues associated with Ni-base alloys Welding Metallurgy and Weldability of Nickel-Base Alloys describes the fundamental metallurgical principles that control the microstructure and properties of welded Ni-base alloys. It serves as a practical how-to guide that enables engineers to select the proper alloys, filler metals, heat treatments, and welding conditions to ensure that failures are avoided during fabrication and service. Chapter coverage includes: Alloying additions, phase diagrams, and phase stability Solid-solution strengthened Ni-base alloys Precipitation strengthened Ni-base alloys Oxide dispersion strengthened alloys and nickel aluminides Repair welding of Ni-base alloys Dissimilar welding Weldability testing High-chromium alloys used in nuclear power applications With its excellent balance between the fundamentals and practical problem solving, the book serves as an ideal reference for scientists, engineers, and technicians, as well as a textbook for undergraduate and graduate courses in welding metallurgy.

A comprehensive survey of the welding methods in use today provides information on all types of welding methods and tools, including manual metal arc welding, gas shielded metal arc welding, tungsten inert gas shielded welding, plasma arc, and cutting.

This authoritative reference thoroughly covers every aspect of thermal welding and associated cutting processes. It is essential reading for welding and production engineers, and students, as well as anyone associated with the selection and application of equipment and consumables.

The ability of stainless steel cladding to increase the resistance of an operating nuclear reactor pressure vessel to extension of surface flaws depends greatly on the properties of the irradiated cladding. Therefore, weld overlay cladding irradiated at temperatures and fluences relevant to power reactor operation was examined. The cladding was applied to a pressure vessel steel plate by the submerged arc, single-wire, oscillating-electrode method. Three layers of cladding provided a thickness adequate for fabrication of test specimens. The first layer was type 309, and the upper two layers were type 308 stainless steel. The type 309 was diluted considerably by excessive melting of the base plate. Specimens were taken from near the base plate-cladding interface and also from the upper layers. Charpy V-notch and tensile specimens were irradiated at 288°C to a fluence of 2 x 1023 neutrons/m2 (>1 MeV). 10 refs., 16 figs., 4 tabs.

The TMEH Desk Edition presents a unique collection of manufacturing information in one convenient source. Contains selected information from TMEH Volumes 1-5--over 1,200 pages of manufacturing information. A total of 50 chapters cover topics such as machining, forming, materials, finishing, coating, quality control, assembly, and management. Intended for daily use by engineers, managers, consultants, and technicians, novice engineers or students.

An authoritative source of reference on every aspect of thermal welding and associated cutting processes. Each process is examined clearly and comprehensively from first principles through to more complex technical descriptions suited to those who need more technical information. Copiously illustrated throughout and with an extensive glossary of terms, this book is essential reading for welding and production engineers, metallurgists, designers, quality control engineers, distributors, students and all who are associated with the selection and application of equipment and consumables. (reprinted with corrections 2001)

This volume presents research papers on micro and nano manufacturing and surface engineering which were presented during the 7th International and 28th All India Manufacturing Technology, Design and Research conference 2018 (AIMTDR 2018). The papers discuss the latest advances in miniature manufacturing, the machining of miniature components and features as well as improvement of surface properties. This volume will be of interest to academicians, researchers, and practicing engineers alike.
Stainless steels represent a quite interesting material family, both from a scientific and commercial point of view, following to their excellent combination in terms of strength and ductility together with corrosion resistance. Thanks to such properties, stainless steels have been indispensable for the technological progress during the last century and their annual consumption increased faster than other materials. They find application in all these fields requiring good corrosion resistance together with ability to be worked into complex geometries. Despite to their diffusion as a consolidated materials, many research fields are active regarding the possibility to increase stainless steels mechanical properties and corrosion resistance by grain refinement or by alloying by interstitial elements. At the same time innovations are coming from the manufacturing process of such a family of materials, also including the possibility to manufacture them starting from metals powder for 3D printing. The Special Issue scope embraces interdisciplinary work covering physical metallurgy and processes, reporting about experimental and theoretical progress concerning microstructural evolution during processing, microstructure-properties relations, applications including automotive, energy and structural.
A Connecticut Yankee fuel assembly (S004) was tested nondestructively and destructively. It was concluded that no obvious degradation of the 304L stainless steel-clad spent fuel from assembly S004 occurred during 5 y of storage in borated water. Furthermore, no obvious degradation due to the pool environment occurred on 304 stainless steel-clad rods in assemblies H07 and G11, which were stored for shorter periods but contained operationally induced cladding defects. The seam welds in the cladding on fuel rods from assembly S004, H07, and G11 were similar in that they showed a wrought microstructure with grains noticeably smaller than those in the cladding base metal. The end cap welds showed a dendritically cored structure, typical of rapidly quenched austenitic weld metal. Some intergranular melting may have occurred in the heat-affected zone (HAZ) in the cladding adjacent to the end cap welds in rods from assemblies S004 and H07. However, the weld areas did not show evidence of corrosion-induced degradation.
This book evaluates the latest developments in nickel alloys and high-alloy special stainless steels by material number, price, wear rate in corrosive media, mechanical and metallurgical characteristics, weldability, and resistance to pitting and crevice corrosion. Nickel Alloys is at the forefront in the search for the most economic solutions to c
The objective of the study on the high-copper welds is to determine the effect of neutron irradiation on the shift and shape of the ASME K{sub Ic} and K{sub Ia} toughness curves. Two submerged-arc welds with copper contents of 0.23 and 0.31 wt % were commercially fabricated in 220-mm-thick plate. Compact specimens fabricated from these welds were irradiated at a nominal temperature of 288°C to fluences from 1.5 to 1.9 x 1019 neutrons/cm2 (>1 MeV). The fracture

toughness test results show that the irradiation-induced shifts at 100 MPa/m were greater than the Charpy 41-J shifts by about 11 and 18°C. Mean curve fits indicate mixed results regarding curve shape changes, but curves constructed as lower boundaries to the data do indicate curves of lower slopes. A preliminary evaluation of the crack-arrest results shows that the neutron-irradiation induced crack-arrest toughness temperature shift is about the same as the Charpy V-notch impact temperature shift at the 41-J energy level. The shape of the lower bound curves (for the range of test temperatures covered), compared to those of the ASME K{sub Ia} curve did not appear to have been altered by the irradiation. Three-wire stainless steel weld overlay cladding was irradiated at 288°C to fluences of 2 and 5 x 1019 neutrons/cm2 (>1 MeV). Charpy 41-J temperature shifts of 13 and 28°C were observed, respectively. For the lower fluence only, 12.7-mm thick compact specimens showed decreases in both J{sub Ic} and the tearing modulus. Comparison of the fracture toughness results with typical plate and a low upper-shelf weld reveals that the irradiated stainless steel cladding possesses low ductile initiation fracture toughness comparable to the low upper-shelf weld. 8 refs., 12 figs., 2 tabs.