TECHNICAL PROGRAM ABSTRACT SUBMITTAL
85TH Annual AWS Convention and 2004 Welding Show
Chicago, Illinois, April 6-8, 2004
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Primary Author: O. M. Barabash
Affiliation: Oak Ridge National Laboratory
Mailing Address: 1, Bethel Valley Road
Bldg: 4508; MS 6096
City: Oak Ridge **State/Province:** TN **Zip/Mail Code:** 37831 **Country:** USA
Email: barabashom@ornl.gov

Co-Author(s):

Name: J. A. Horton Jr
Affiliation: Oak Ridge National Laboratory
Address: 1, Bethel Valley Road
Bldg: 4500S-MS 6115
City: Oak Ridge
State/Province: TN
Zip/Mail Code: 37831
Country: USA E-Mail: hortonja@ornl.g

Name: S. S. Babu
Affiliation: Oak Ridge National Laboratory
Address: 1, Bethel Valley Road
Bldg: 4508; MS 6096
City: Oak Ridge
State/Province: TN
Zip/Mail Code: 37831
Country: USA E-Mail:

Name: R. I. Barabash
Affiliation: Oak Ridge National Laboratory
Address: 1, Bethel Valley Road
Bldg: 4500S-MS 6115
City: Oak Ridge
State/Province: TN
Zip/Mail Code: 37831
Country: USA E-Mail:

Name: S. A. David
Affiliation: Oak Ridge National Laboratory
Address: 1, Bethel Valley Road
Bldg: 4500S-MS 6115
City: Oak Ridge
State/Province: TN
Zip/Mail Code: 37831
Country: USA E-Mail:

Answer the following about this paper

Original submittal? Yes ☒ No☐ Progress report? Yes ☐ No☒ Review paper? Yes ☐ No☒ Tutorial? Yes ☐ No☒
What welding processes are used? GTAW
What materials are used? Single Crystal Nickel Base Superalloys
What is the main emphasis of this paper? Process Oriented ☐ Materials Oriented ☒
To what industry segments is this paper most applicable? Energy Industries
Has material in this paper ever been published or presented previously? Yes ☐ No☒
If "Yes", when and where?

Keywords: Please indicate the top four keywords associated with your research below

_____ _____

_____ _____

Guidelines for abstract submittal and selection criteria:

- Only those abstracts submitted on this form will be considered. Follow the guidelines and word limits indicated. Complete this form using MSWord. Submit electronically via email to dorcas@aws.org.

Technical/Research Oriented

- New science or research.
- Selection based on technical merit.
- Emphasis is on previously unpublished work in science or engineering relevant to welding, joining and allied processes.
- Preference will be given to submittals with clearly communicated benefit to the welding industry.

Applied Technology

- New or unique applications.
- Selection based on technical merit.
- Emphasis is on previously unpublished work that applies known principles of joining science or engineering in unique ways.
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Education

- Welding education at all levels.
- Emphasis is on education/training methods and their successes.
- Papers should address overall relevance to the welding industry.

Check the category that best applies:

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Proposed Title (max. 50 characters): Deformation Strains In Single Crystal Alloy Welds

Proposed Subtitle (max. 50 characters):

Abstract:

Introduction (100 words max.) – Describe the subject of the presentation, problem/issue being addressed and it's practical implications for the welding industry. Describe the basic value to the welding community with reference to specific communities or industry sectors.

Repair welding of single crystal nickel base superalloys is a crucial technology needed for economical reuse and repair of used and defective turbine components. The final performance of these welds is clesly related to microstructure evolution in both heat-affected-zone and weld metal regions. In this research, the interaction between microstructure evolution and dislocation movment in the HAZ region was investigated with Laue diffraction and transmission electron microscopy.

Technical Approach, for technical papers only (100 words max.) – Explain the technical approach, experimental methods and the reasons why this approach was taken.

A single crystal TMS-75 alloy rod in standard heat treated condition was investigated. Spot welds were made on these rods with different cooling conditions with following welding parameters: 17.5 Volts and 110 Amps. The microstructure was characterized with optical microscopy and transmission electron microscopy. The deformation strains as a function of distance from the fusion line was characterized with Laue diffraction analysis far two different cooling rates.

Results/Discussion (300 words max.) – For technical papers, summarize the results with emphasis on why the results are new or original, why the results are of value. For other papers, elaborate on why this paper is of value to the community, describe key work in the field and provide an integration of these separate activities into a "continuum."

The laue diffraction analysis showed that the single crystalline nature was maintained in the fusion zone region which is manifested by the presence of sharp diffraction spots. In contrast, the diffraction spots were elongated indicating the presence of elastic/plastic strains. The extent of elongation was higher in rapidly cooled welds, in comparison to slowly cooled welds. Transmission electron microscopy analysis showed rapid decrease in dislocation content with increasing distance from fusion line and was in qualitative agreement with Laue Diffraction analysis. In addition, the results show complex interaction between dislocation and the gamma prime precipitates was analized. The results have large implications on the cracking behavior during repair welding of single crystal superalloys.

Conclusions (100 words max.) – Summarize the conclusions and how they could be put to use – how and by whom.

Laue diffraction analysis indicated a large increase in dislocation density close to the fusion line of a spot weld made on single crystal nickel base superalloy. The results so far shows complex interplay between deformation and microstructural evolution in the HAZ of nickel base superalloys and have implications on weld cracking behavior.

Research sponsored by the Division of Materials Sciences and Engineering, U.S. Department of Energy, under Contract DE-ACO5-000R22725 with UT-Battelle,LLC.

NOTE: Abstract must not exceed one page and must not exceed the recommended word limit given above

Note: Presentations should avoid the use of product trade names. Also, the use of "customary US units" is recommended.

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