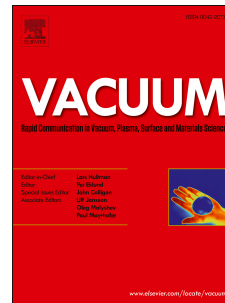


Accepted Manuscript

Effect of weld parameters on porosity formation in electron beam welded Zircaloy-4 joints: X-ray tomography study

Bharath Bandi, Soumitra Kumar Dinda, Jyotirmaya Kar, Gour Gopal Roy, Prakash Srirangam



PII: S0042-207X(18)31259-4

DOI: [10.1016/j.vacuum.2018.09.060](https://doi.org/10.1016/j.vacuum.2018.09.060)

Reference: VAC 8273

To appear in: *Vacuum*

Received Date: 17 July 2018

Revised Date: 28 September 2018

Accepted Date: 29 September 2018

Please cite this article as: Bandi B, Dinda SK, Kar J, Roy GG, Srirangam P, Effect of weld parameters on porosity formation in electron beam welded Zircaloy-4 joints: X-ray tomography study, *Vacuum* (2018), doi: <https://doi.org/10.1016/j.vacuum.2018.09.060>.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Effect of weld parameters on porosity formation in Electron Beam Welded Zircaloy-4 Joints: X-ray tomography study

Bharath Bandi¹, Soumitra Kumar Dinda¹, JyotirmayaKar¹, Gour Gopal Roy¹, Prakash Srirangam².

¹ Department of Metallurgical and Materials Engineering, Indian Institute of Technology-Kharagpur, India.

²Warwick Manufacturing Group (WGM), University of Warwick, Coventry, CV4 7AL, UK

*Corresponding author email: p.srirangam@warwick.ac.uk

Abstract:

Zircaloy-4 to Zircaloy-4 (Zr-4) similar butt joints were prepared using Electron Beam Welding (EBW) technique under different weld conditions such as with beam oscillation, without beam oscillation and at different welding speeds. Three-dimensional (3D) visualization of porosity in weld joints was carried out using X-ray computed tomography (XCT) technique. Quantification of porosity such as the average size, number and shape of the pores were evaluated and compared among weld joints produced under different conditions. XCT results show that the porosity of the welds increased substantially with the increase in the weld speed. More interestingly, the results also show that there is a significant decrease in porosity of the joint produced with beam oscillation condition. An increase in weld speed from 700 mm/min to 1000 mm/min resulted in a significant increase in pore density (from 16 to 313 per mm³) and it was observed that the average size of the macro pores increased from 96.4 μm to 121.5 μm . The joints prepared with beam oscillation produced least number of pores with minimum percentage of macro pores and maximum percentage of spherical pores in it. Raman spectroscopy results confirmed the presence of hydrogen gas in pores of all the weld joints.

Keywords: Zircaloy-4, Electron beam welding (EBW), Beam Oscillation, X-ray computed tomography (XCT), Porosity.

Download English Version:

<https://daneshyari.com/en/article/11026551>

Download Persian Version:

<https://daneshyari.com/article/11026551>

[Daneshyari.com](https://daneshyari.com)