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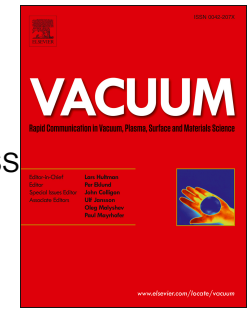

x-ray tomography study on porosity in electron beam welded dissimilar copper–304SS joints

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PII: S0042-207X(17)31489-6

DOI: 10.1016/j.vacuum.2017.12.038

Reference: VAC 7744

To appear in: *Vacuum*

Received Date: 28 October 2017

Revised Date: 22 December 2017

Accepted Date: 23 December 2017

Please cite this article as: Kar J, Dinda SK, Roy GG, Roy SK, Srirangam P, x-ray tomography study on porosity in electron beam welded dissimilar copper–304SS joints, *Vacuum* (2018), doi: 10.1016/j.vacuum.2017.12.038.

X-RAY TOMOGRAPHY STUDY ON POROSITY IN ELECTRON BEAM WELDED DISSIMILAR COPPER–304SS JOINTS

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ABSTRACT: Dissimilar joining of copper (C10300) to AISI–304 Stainless Steel **(SS)** sheets was performed using Electron Beam Welding **(EBW)** process. EBW was performed for two weld conditions such as with beam oscillation and without beam oscillation. X-ray Computed Tomography **(XCT)** technique was used for three-Dimensional **(3D)** visualization and quantification of porosity in the weld region. It was observed that the application of beam oscillation resulted in less porosity and the average pore size was found to be smaller as compared to without beam oscillation condition. Also, pores were found to be uniformly distributed in the weld incase of with beam oscillation as compared to without beam osicllaition condition. Further, it was observed that there exists an optimum beam oscillation diameter beyond which there is no positive effect of beam oscillation in controlling the porosity formation in the weld joint.

KEYWORDS: Electron beam welding; Beam oscillation; Stainless steel; Copper; X-ray computed tomography; Porosity

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1. INTRODUCTION

The ability to manufacture a product using dissimilar metals/alloys by welding greatly increases the flexibility in design and production of components for engineering applications. Copper–SS dissimilar joint is one such joint which finds applications in the field of power generation industries, heat transfer components, nuclear sector, and cryogenic sector. This type of dissimilar joint is designed to provide excellent thermal and electrical conduction imparted by copper and strength, wear and corrosion resistance imparted by SS. However,