

21<sup>st</sup> International Conference on

# Advanced Materials & Nanotechnology

September 04-06, 2018 | Zürich, Switzerland

## Investigation on weldability behavior of chromium-free nickel filler with stainless steel AISI-304

Nataraj J R<sup>1</sup>, K Koushik<sup>1</sup>, Krishna M<sup>1</sup> and Karthik S B<sup>2</sup><sup>1</sup>R V College Of Engineering, India<sup>2</sup>Dayananda Sagar University, India

Two novel Cr-free nickel based welding filler rods were fabricated and used to weld austenitic grade stainless steel 304 (SS304) by tungsten inert gas (TIG) welding. Two welding wires designated as 3S (without Mn) and 4N (with 2% Mn) of %wt composition 43.499Ni, 25Fe, 10Mo, 10Cu, 10Co, 0-2 Mn, 1Ti, 0.5Al and 0.001C were fabricated and welded to SS304. Comparative studies of the joints welded by these two filler rods are presented. The weld joints were characterized for microstructure, mechanical and fracture properties. The microstructure of the weld interface showed presence of TiC and MoC precipitates within the grains and along the grain boundaries which is attributed for its strength of the weld joints. The Unmixed zone in the joint welded by 3S filler rod is wider than that welded with 4N filler rod. Presence of 2% Mn in 4N filler rod promotes the formation of  $\gamma'$  (gamma prime) precipitates and hence may be responsible for better joint strength than joints welded by 3S filler rod. Tensile tests results showed joint strength due to 4N filler rod is marginally superior (by 3.5%) to joints welded by 3S filler rod. However the ductility of the joint welded by 4N filler rod was lower by 6% compared to the joint welded by 3S filler rod. The hardness across the weld joints showed softer heat affected zone (HAZ) and hence is susceptible for failure during mechanical loading. The joint welded with 4N filler rod underwent significant amount of plastic deformation before failure. The joints welded with both the filler rods showed ductile mode of failure.

### Recent Publications:

1. Umesh Kumar B, Nataraj J R and Gangadhar (2017) Design of HDPC die for automotive vane pump component. T G International e-Journal for Technology and Research 1:5.
2. Nachiketh Ramesh, Moshin Paschapure, Nikhil Nippanikar, Sarvesh Karigoudar, J R Nataraj and K Badarinarayana (2016) Performance studies of sustainable solar dryer for drying agricultural products. Indian Journal of Science and Technology 9(45).
3. Nataraj J R, G R Rajkumar, M Krishna, H N Narasimhamurthy and Keshavamurthy Y C (2014) Investigation of tensile and bending behavior of aluminum based hybrid fiber metal laminates. Procedia. Materials Science 5:60-68.
4. J R Nataraj, M Krishna, H N Narasimha Murthy, C S Prasad, V T Bhanukiran and S C Sharma (2013) Synthesis and characterization of novel chromium free nickel alloy electrodes materials. Metallurgical and Materials Transactions A 44(7):3271-3280.
5. J R Nataraj, V T Bhanukiran, M Krishna and Satish Kumar (2012) Development and characterization of electrode deposition procedure for crack-free hard facing of low carbon steel. IACSIT-International Journal of Engineering and Technology 4(1):18-25.

### Biography

Nataraj J R is an Associate Professor in the Mechanical Department at R V College of Engineering, Bengaluru. He has more than 12 years of teaching and research experience and two years of industrial experience. He has completed his ME at University of Applied Sciences, Wildau, Berlin, Germany with scholarship grants from prestigious DAAD in the year 2003-05. He has completed his Doctoral degree at Kuvempu University, Karnataka, India in 2014 in the field of Cr-free welding and new materials development. He has 27 research publications and is a member of several societies such as ISSS, ISTE, ISSE, ASM, and IEI. He is also a Reviewer/Editorial Board Member for several national and international journals. His research areas are Stainless Steel Welding, New Materials Development, Composite Materials, Heat Treatment, Thin Film Sensors, Inter Metallic and Renewable Energy.

natarajjr@rvce.edu.in