

# EFFECT OF CURRENT PULSATION ON WELD MICROSTRUCTURE DURING MICRO-PLASMA ARC WELDING OF INCONEL 718

A. K. Sahu\* and S. Bag

Department of Mechanical Engineering, Indian Institute of Technology Guwahati,  
Guwahati 781039, Assam, India

\* Corresponding author

## ABSTRACT

The current investigation focused on micro-plasma arc welding of Inconel 718 sheets by constant current (CC) and pulse current (PC) mode. Formation of Nb-rich Laves phase in the solidified microstructure of weld fusion zone has detrimental effect on the weld mechanical properties. The effect of current pulsation on the weld microstructural morphology, formation of Laves phase and its consequence on mechanical properties are meticulously studied herein. The tensile properties of the welded joints are found to be inferior to the base material due to the formation of intermetallic Laves phase in the inter-dendritic region during solidification. PC mode weld have shown improvements in hardness and tensile properties as compared to the CC mode welding. The tensile ductility has shown significant improvement (47%) with the application of pulse current as compared to constant current mode of welding. Application of pulse current changes the microstructural morphology in the fusion zone and improves the weld cooling rate, which further refines the fusion zone microstructure. This refined microstructure reduces the Nb segregation in the interdendritic region and further diminishes the amount of Laves phase formation.

**Keywords:** Inconel 718, Laves phase, Segregation, Microstructure, Pulsed welding.

