



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Programme of Study : Ph.D.

Thesis Title: **Micro Plasma Arc Welding of Similar and Dissimilar Materials and Formability Study of Welded Joint**

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SHORT ABSTRACT

This research focuses on the similar and dissimilar joining of austenitic stainless steel (316L) and Inconel 625 using Micro Plasma Arc Welding (MPAW). The study evaluates joint metallurgy and investigates its impact on the formability of welded blanks. Welding experiments with varying parameters are conducted to optimize joint strength and formability. Advanced characterization techniques, including XRD, TEM, and FESEM, are employed to analyse microstructures and phases in the fusion zone. The solution heat treatment improves formability by reducing dislocation density and dissolving secondary phases.

In dissimilar welds, the fusion zone displays a dendritic structure with brittle Laves phases, impacting the mechanical properties and forming behavior. The maximum joint efficiency, elongation, and dome height values reveal insights into weld performance. A small-scale stretch forming setup and limiting dome height tests are utilized to evaluate deformation behavior. This comprehensive analysis highlights the significance of joint metallurgy in improving strength, hardness, and formability, contributing to applications in high-temperature and corrosive environments like boilers and oil refineries.