National Institute of Technology Rourkela

Registration Seminar

Seminar Title	: Microstructure and Mechanical Properties of Cold Metal Transfer Welding of Kovar Alloy and Stainless Steel (SS 302L)
Speaker	: Ranjan Mandal (Rollno : 523mm1001)
Supervisor	: Swapan Kumar Karak
Venue	: PG-Building Seminar Room (Annex MM)
Date and Time	: 07 Jul 2025 (3:30 PM)

Abstract : This research explores the microstructural and mechanical behavior of dissimilar metal joints formed between Kovar alloy and Stainless steel 302L (SS302L) by using cold metal transfer (CMT) welding with varying different welding parameters. The specimens are designed in such a way with combinations of Kovar and SS302Lwith gap (0.8 mm) such as KS-2, Ks-3 and KS-4 or without gap such as KS-1 and KS-5 by using varying heat input (108 J/mm to 165 J/mm) and travel speeds (400 mm/min to 800 mm/min) welding through the CMT process. Optical microscopy, scanning electron microscopy (SEM), and X-ray diffraction (XRD) were used to examine the microstructure of different weld zones, including the fusion zone (FZ), heat-affected zone (HAZ), and base metal (BM). Vickers micro hardness testing is performing across these zones to evaluate the mechanical integrity of the weld. The weld zone has dendritic structure formation due to rapid solidification. The Austenitic phases was observed across all regions, as confirmed by XRD. Energy Dispersive Spectroscopy (EDS) results demonstrated successful elemental fusion and diffusion between the dissimilar metals. The presence of intermetallic phases led to increased hardness in the weld zone, indicating a strong structure-property correlation. Variation in welding parameters showed a substantial influence on weld bead morphology, phase formation, and mechanical properties. Micro hardness in the weld metal was significantly higher than in the base metal, indicating strong joint integrity. The results confirm that CMT welding is a viable method for joining dissimilar metals with improved mechanical performance and controlled microstructural evolution.

Keywords: Cold Metal transfer (CMT),Low heat input welding, Stainless steel 302L, Kovar alloy, dissimilar metal welding