Seminar

Institute for Plasma Research

Title : Laser Material processing of Advanced Engineering Materials

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Date : 9th October 2020 (Friday)

Time : 3.30 PM

Venue : Online - Join the talk:
https://meet.ipr.res.in/DrSumanChatterjee_PDFTalk

Abstract :

Conventional machining of advanced engineering materials (stainless steel, titanium alloy and shape memory alloy) is extremely difficult because of occurrence of heat generation, rapid tool wear and frequent tool breakage. Likewise, conventional welding processes poses difficulty in fabrication works made of advanced engineering materials such as stainless steel, titanium alloy and shape memory alloy due to excessive heat generation causing high risk of contamination and distortion of weldment. Therefore, laser (Light Amplification by Stimulated Emission of Radiation) is gaining popularity for drilling as well as welding because a high intensity heat source is applied at the precise location to achieve the desired output. The present study focusses on laser material processing of advanced engineering materials. In order to gain insight into effect of process parameters on output measures during manufacturing processes has been insight in the present study. Joining of dissimilar materials is a difficult fabrication process because of formation of brittle intermetallic compounds (IMCs) attributed to incompatible physical and metallurgical properties and difference in coefficients of thermal expansion of the materials. As a result, initiation and growth of the transverse crack in the weld pool is observed. Therefore, the present study explores an experimental investigation of welding of dissimilar materials such as nitinol with advanced engineering materials providing copper as an interlayer using laser system. The study indicates that minimum tensile strength of the welded joint is more than the ultimate tensile strength of the weakest intermediate material i.e. copper. The study examines the possibility of using high melting point intermediate layer material during welding of nitinol with other materials to avoid formation of unwanted phases. Parametric study of laser manufacturing/fabrication processes helps the practitioners in providing guidelines to improve the quality of manufactured/fabricated components.

1. Dissimilar welding of titanium alloy with nickel titanium alloy
2. Process parameters such as laser power, scanning speed and pulse frequency
3. Analysis of weldments such as welding strength, microhardness, fractography, pore analysis and radiography analysis.