

LASER WELDING CHARACTERIZATION OF KOVAR AND STAINLESS STEEL ALLOYS AS SUITABLE MATERIALS FOR COMPONENTS OF PHOTONIC DEVICES PACKAGING

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Abstract:

The weldability of Kovar and stainless steel alloys by Nd:YAG laser beam is studied through changing of some laser beam parameters.

It has been found that there is a suitable interaction of the pulsed laser beam of low power laser pulse with both alloys. The change of thermo physical properties with absorbed energy from the laser pulse is discussed in this paper which reports the suitability of both Kovar and stainless steel 304 as the base materials for photonic devices packaging.

We used laser weld system (LW400S from Newport) which employs Nd:YAG laser system with three simultaneous beam output for packaging of 980 nm high power laser module. The effect of changing the power density, pulse energy and pulse duration was shown to have a good correlation to both laser spot width and penetration depth. Optimization for both pulse peak power and pulse duration is required in achieving a suitable aspect ratio of laser spot width to penetration depth. This is important to reduce the heat affected zone (HAZ) which affects the sensitive optical components.

An optimum value of the power density in the order of 10w/cm found to be suitable to induce melting in the welded joints without vaporization. The desired ratio can also be optimized by changing the focus position on the target material as illustrate from our measurements. A theoretical model is developed to simulate the temperature distribution during the laser pulse heating and predict the penetration depth inside the material. From the metallurgical and SEM measurements the weld spot shows a suitable weld yield with reasonable weld width to depth ratio.