Laser welding liquid flow energy storage

Titanium and titanium alloys with a medium thickness of 5 to 12 mm are widely used for ocean platforms, military equipment and in other fields because of their light weight, appropriate strength and corrosion resistance. In this study, autogenous laser welding and narrow-gap laser welding processes were researched and compared, and the welding ...

Laser transmission welding (LTW) is an excellent process for joining plastics and is widely used in industry. Numerical simulation is an important method and area for studying LTW. It can effectively shorten the experimental time and reduce research costs, aid in understanding the welding mechanism, and enable the acquisition of ideal process ...

On the other hand, oscillating laser-arc hybrid welding, as a new technology, has significant advantages in addressing porosity issues and improving molten pool fluidity in aluminum alloy welding [17], [18], [19]. Moreover, beam oscillation has been proven to improve gap tolerance in laser welding by optimizing energy distribution [20], [21 ...

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Laser welding can be achieved using either a continuous or pulsed laser beam, and the principle of laser welding can be divided into heat conduction welding and laser deep fusion welding. For heat conduction welding, the power density is less than 104 to 105 W/cm 2, resulting in a shallow melt depth and slow welding speed.

A mathematical model for flow simulation of full penetration laser beam welding of titanium alloy is presented. In this model, the heat source comprises a plane heat source on the top surface and a cylindrical heat source along the z-direction, which takes into account the plasma effect and the keyhole absorption solving the conservation equations of energy, ...

The laser welding can be used. A future tool that, because of its heat, is preferred over other joining methods, such as arc welding. Filling type and its effect on the microstructure. ... Experimental analysis of novel ionic liquid-MXene hybrid nanofluid"s energy storage properties: Model-prediction using modern ensemble machine learning ...

The Stored Energy welding power supply - commonly called a Capacative Discharge Welder or CD Welder - extracts energy from the power line over a period of time and stores it in welding capacitors. Thus, the

effective weld energy is independent of line voltage fluctuations. This stored energy is rapidly discharged through a pulse transformer producing a flow of electrical current ...

Liquid motion in fusion welding plays the important role in the heat and mass transfer as well as stability of bead formation. In an arc weld pool, many works have been intensively conducted experimentally and theoretically. In a keyhole laser welding, however, there is few comprehensive study on the metal flow and its related phenomena in weld ...

investigated to allow for single-pass laser welding of thick aluminum plates. Hereby, the flow pattern in the molten zone and thus also the temperature distributions are significantly changed.

Theoretically, laser results from stimulated radiation. In particular, an incident photon will cause the decay of an excited electron of a material to the ground state if they possess the identical energy, as shown in Figure 2 A, accompanied by the emission of another photon possessing frequency and phase identical to those of the incident one. 27 These two photons ...

The CFD model takes into account liquid metal flow, heat transfer and ac electromagnetic fields. ... CFD simulation of the liquid metal flow in high power laser welding of aluminum with ...

In this paper, the laser welding process of 6082-T6 and 6063-T6 dissimilar aluminum alloys with a thickness of 2.5 mm was numerically simulated by using a rotary surface Gauss heat source and the flow state of the weld pool was analyzed. The microstructure and mechanical properties of the welded joint (WJ) with a laser power of 1.75 kW were also ...

The effect of Marangoni convection and Peclet number during laser spot welding of stainless-steel is investigated by He et al. [4], wherein it is observed that the weld pool dynamics is dominated by convection once the system attains steady state.Liu et al. [5] simulated the keyhole and dynamics of the molten pool and revealed the mechanism of porosity ...

Afanas"eva et al. (2013) adapted the electromagnetic field to change the flow of plasma and weld pool during laser welding, which could reduce the density of charged particles on the laser transmission channel and thus improve the laser utilization rate. The uneven element distribution and insufficient phase transformation occur in laser ...

LASERCHINA engineers have adopted laser welding, a type of fusion welding, to join battery tabs with unparalleled precision and strength. Utilizing a laser beam as the source of energy, this method boasts high energy density, minimal deformation, narrow heat-affected zones, and rapid welding speeds.

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