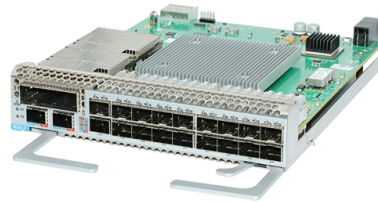


Laser Diode Melting



Summary of Content

Laser diode melting uses focused diode lasers to melt materials, enabling precise additive manufacturing and material processing with high efficiency and control.

Overview

Laser diode melting (LDM) refers to the process of using laser diodes as the energy source to melt materials, typically metals or semiconductors, for applications such as additive manufacturing, repair, or crystal growth. Unlike traditional high-power fiber lasers, diode lasers operate at shorter wavelengths and lower powers, which can improve energy absorption and process efficiency .

Applications in Additive Manufacturing

A prominent method using laser diodes is Diode Area Melting (DAM), an alternative to traditional Laser Powder Bed Fusion (LPBF). DAM integrates multiple individually addressable low-power diode lasers into a laser head that traverses a powder bed to melt metallic feedstock layer by layer . Key advantages include:

- Higher absorption efficiency: Shorter wavelengths (e.g., 450 nm or 808 nm) increase absorption in metals like Ti6Al4V, improving melting efficiency by up to 14% compared to longer wavelengths .
- Lower cooling rates: DAM generates slower cooling rates (≈ 600 °C/s) than traditional LPBF ($\approx 10^7$ °C/s), which can influence microstructure, grain size, and mechanical properties .
- Scalability and compactness: Multiple low-power diodes allow for a more compact and scalable system compared to high-power fiber lasers.

Article Content

What is laser melting?

Diode, solid state and CO₂ laser systems are all used to produce such welds in metallic materials. In plastics materials such as

Catastrophic optical damage

Catastrophic optical damage Four electron micrographs of a green laser diode PLT5 with catastrophic optical damage on one side of

[1211.0095] Laser-diode-heated floating zone (LDFZ) method

We have developed the laser-diode-heated floating zone (LDFZ) method, in order to improve the broad and

Tilted LASER Diode Floating zone furnace | PARADIM

Compared to traditional light sources, laser diodes offer exceptional temperature stability and angled heating imparts

Effect of high power diode laser surface melting on wear resistance of ...

Laser-melted samples were subjected to a two-body abrasive wear test using a modified pin-on-disc set up. The

MULTIPLE 450 nm DIODE LASER PROCESSING OF Ti64

To overcome these challenges, a new system was developed which can accommodate multiple short-wavelength diode lasers (3-5W

Laser diode area melting for high speed additive manufacturing of ...

This work details the development of a new additive manufacturing process known as Diode Area Melting (DAM). This process

Investigating the melt pool properties and thermal effects of multi ...

Diode area melting (DAM) is a new additive manufacturing process that utilises customised architectural arrays of low

Laser Diode Area Melting for High Speed Additive Manufacturing of ...

Selective Laser Melting (SLM) is additive manufacturing (AM) technology aimed at melting and fusing metal powders

Diode area melting of Ti6Al4V using 808 nm laser ...

This paper presents an alternative to traditional laser powder bed fusion (LPBF), using an efficient, highly scalable multi

Diode area melting of SS316L using low power 450 nm lasers

Diode Area Melting (DAM) is an alternative to traditional LPBF using multiple low-power (~ 3.5 W) short-wavelength fiber-coupled

Diode area melting single-layer parametric analysis of 316L ...

Diode area melting (DAM) is a novel additive manufacturing process that utilises customised architectural arrays of

Diode Laser Weld Toe Re-melting as a Means of Fatigue Strength ...

Laser peening improves surface quality and fatigue performance more effectively . Another way using diode

Diode area melting of SS316L using low power 450 nm lasers

Laser Powder Bed Fusion (LPBF) is a widely used Additive Manufacturing (AM) technology for the fabrication of

Laser-diode-heated

ABSTRACT We have developed the laser-diode-heated floating zone (LDFZ) method, in order to improve the broad and

Laser Floating Zone Growth: Overview, Singular Materials, Broad

Most of these implied the use of laser diodes both to improve radial heating, envisaging the growth of incongruently

Pulsed Laser Heating and Melting

Strictly, a full discussion of surface modification by laser processing should include laser ablation and marking, but, interesting though

Laser diode area melting for high speed additive manufacturing of ...

However this deflected laser raster scanning methodology is high cost, energy inefficient and encounters significant limitations on

Dual-laser powder bed fusion using 450 nm diode area melting and

Unlike conventional PBF-LB systems that employ a single laser type, this dual-laser setup integrates a traversing

Diode Laser Weld Toe Re-melting as a Means of Fatigue Strength ...

Re-melting of weld toes to improve the surface profile and thus reduce stress concentrations is a known fatigue

Laser-diode-heated floating zone (LDFZ) method ...

The laser-diode-heated floating-zone (LDFZ) is a new variant of the floating-zone (FZ) technique where the molten

Numerical and experimental study of the temperature field evolution of ...

During the laser surface melting (LSM) of AZ31B Mg alloy, obtaining desired temperature field distribution is essential

Microstructure and mechanical property in diode laser melting

Laser melting deposition (LMD) has great advantages and broad development prospects in the manufacture of high

Laser Diode Area Melting for High Speed Additive ...

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PARAMETRIC INVESTIGATION OF SINGLE-LAYER

manufacturing approach to create complex structures with good mechanical properties and surface quality via melting metal powder

Laser melting, evaporation, and fragmentation of nanoparticles ...

Processes of laser melting, evaporation, and fragmentation of metal nanoparticles are examined experimentally and

Effect of High Power Diode Laser Surface Melting on Corrosion ...

This paper reports the effect of laser surface melting on corrosion performance of magnesium alloys AZ31 and AZ61. A 1.5 kW high

Diode area melting of SS316L using low power 450 nm lasers

This study investigates the use of Diode Area Melting (DAM) to process 316L stainless steel (SS316L), an alternative

Laser Material Processing, Fourth Edition

In material processing the laser must be reasonably powerful, which reduces the number of eligible lasers to only a few – essentially

Influence of diode laser surface melting on microstructure and ...

Abstract High power diode laser (HPDL) has been used for surface melting of 7075-T651 aluminium alloy in order to

Diode area melting of SS316L using low power 450 nm lasers

This paper presents an alternative to traditional laser powder bed fusion (LPBF), using an efficient, highly scalable

Laser sealing of organic light-emitting diode using low melting ...

Glass frit encapsulation for laser-base sealing of the complex interiors results challenges for the electronics

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