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Laser beams are used to process

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metals, dielectric materials and semiconductors. Figure 1 indicates how the absorptivity of materials at ambient temperature varies as a function of laser wavelength. The wavelength of the UV krypton fluoride excimer laser and the IR Nd:YAG solid-state and CO<sub>2</sub> gas laser, are also

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shown in this figure. Due to the properties shown in Table 1, materials processing lasers are capable of both pyrolytic (processes which involve direct heating of the material) and ...

What happens when a laser beam interacts with a material ...

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Laser-Beam Interactions with Materials: Physical ...

This SI is dedicated to recent progress in Laser Science and Technology, in particular in the field of laser



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then into thermal

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Laser Beam Interactions with Solids •

In absorbing materials photons

deposit energy  $E = h\nu = \frac{hc}{\lambda}$  where  $h$

= Planck's constant =  $6.63 \times 10^{-34} \text{ J s}$   $c$

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= speed of light • Also photons also transfer momentum  $p = \frac{h\nu}{c}$

Note: when light reflects from a mirror momentum transfer is doubled

• eg momentum transferred from Nd:YAG laser photon

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The field of laser-material interactions is inherently multidisciplinary. Upon impact of a laser beam on a material, electromagnetic energy is converted first into electronic excitation and then into thermal, chemical and mechanical energy.

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The laser-matter interaction is an interdisciplinary and complicated subject [1]. When the material is irradiated with lasers, the laser energy will be firstly transformed into electronic excitation energy and then transferred to lattices of materials through collisions between electrons

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Abstract Lasers provide the ability to accurately deliver large amounts of energy into confined regions of a material in order to achieve a desired response.

Chapter 4 Fundamentals of Laser-Material Interaction and ...

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annealing, hole drilling and fusion plasma production.

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This additive process uses a silica precursor gas coupled with a CO<sub>2</sub> laser beam to deposit material on the damaged surface with nanoscale precision. The precursor gas flows through a nozzle onto the optic

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surface along with the laser beam. The beam then decomposes the gas and deposits solid  $\text{SiO}_2$  on the damaged optic surface.

Studying Laser-Material Interaction with Multiphysics ...

the laser-material interaction, is very



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sensitive to the laser pulse shape, so we compared the effects produced by a Table 1. Parameters used for simulation of the alexandrite laser beam interaction with the P7295-2 carbon fiber. Pulse duration 20 ms Pulse repetition 1 Hz Energy density 36 J cm<sup>2</sup> Beam diameter 10 mm

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