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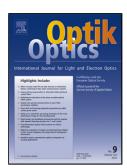
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**Analytical solutions for three-dimensional** 

modeling of temperature rise inside solid

material induced by laser irradiation

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**Abstract:** 

In this paper, analytical solutions for three-dimensional(3-D) modeling of

temperature rise inside solid material induced by laser irradiation is presented. Firstly,

the theoretical physical model of temperature rise for a material surface irradiated by

laser is established based on classical heat conduction theory. Then, integral transform

method is used to solve the heat conduction equation and its analytical solutions are

obtained. In the end, the square and elliptical Gaussian laser beam is selected as

examples, and temperature distributions of silicon material irradiated by the two lasers

are simulated. Results show that, when silicon material is irradiated by laser, the

shape of temperature distributions on the surface of material are similar to that of the

laser intensity due to direct absorption mechanism of laser energy on the material

surface. The temperature distributions in a certain depth below the material surface

also contain the shape information of laser intensity on the material surface.

**Keywords:** Analytical solutions; Laser heating; Three-dimensional modeling;

Temperature rise

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