

## A Study on Photothermal Waves in a Semiconductor Material Photogenerated by a Focused Laser Beam

Ibrahim A. Abbas\*

*Department of Mathematics, Faculty of Science and Arts – Khulais  
University of Jeddah, Saudi Arabia*

*Nonlinear Analysis and Applied Mathematics Research Group (NAAM)*

*Department of Mathematics  
King Abdulaziz University, Jeddah, Saudi Arabia*

*Department of Mathematics, Faculty of Science  
Sohag University, Sohag, Egypt  
ibrabbas7@yahoo.com*

K. A. Aly

*Department of Physics  
Faculty of Science and Arts – Khulais  
University of Jeddah, Saudi Arabia*

*Department of Physics  
Faculty of Science, Al-Azhar University  
Assuit Branch, Assuit, Egypt  
kamalaly2001@gmail.com*

Received 10 June 2016

Accepted 11 October 2016

Published 28 November 2016

In this work, the theory of coupled plasma, thermal and elastic waves were used to investigate the wave propagation on semiconductor material during photo-thermo-elastic process. A thin slim strip (TSS) medium, elastic semiconductor with isotropic and homogeneous thermal and elastic properties have been considered. The plasma, thermal and elastic waves in a TSS photo generated by a focused and intensity modulated laser beam were analyzed. Laplace transform techniques and eigenvalue approach were used to obtain the analytical solutions for carrier density, displacement, temperature, and stress. Numerical computations have been carried out on silicon-like semiconductor material. The results are presented graphically to show the effect of the coupling between the plasma, thermal, and elastic waves.

*Keywords:* Laplace transformation; semiconducting material; thin slim strip; eigenvalue approach; laser beam.

PACS Nos.: 78.40.Fy, 52.35.Fp

\*Corresponding author.