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MODELING & ANALYSIS OF POROUS MEDIA BASED BIO-HEAT TRANSFER FOR LASER INDUCED PHOTO THERMAL THERAPY

D. Chandra Mohan Vyas[*], Sumit Kumar[*] and Atul Srivastava[*,§]
[*]Dept. of Mechanical Engineering, Indian Institute of Technology Bombay, Mumbai, India
[§]Correspondence author. Fax: +91 22 2572 6875 Email: atulsr@iitb.ac.in

ABSTRACT The present work is concerned with the development and application of porous media theory based bio-heat transfer model for investigating the thermal response of a laser-irradiated biological tissue phantoms. The tissue phantoms has been modeled as a porous media and coupled with the radiative transport equation that describes the phenomena of light propagation. The radiative transport equation has been solved using the discrete ordinate method to determine the 2-D distribution of light intensity within the tissue, while finite volume method based discretization has been employed for solving the heat transfer in the porous tissue under non thermal equilibrium mode. The developed numerical model has been validated against the results available in the literature. A rigorous series of benchmarking tests were performed on the developed bio-heat transfer model, and the results are presented. The bio-heat transfer model was coupled with the collimated component of the laser irradiation and the temperature distributions were determined. Various interface models have been used and discussed to capture the temperature gradients across the tissue-blood vessel interface.