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Simulation of Temperature Distribution of DNA/RNA of Human Cancer Cells Using Time–Dependent Bio–Heat Equation and Nd: YAG Lasers

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In this study, we simulated temperature distribution of DNA/RNA of human cancer cells when exposed to short pulses of Nd: YAG lasers. To end this goal, we considered a real three-dimensional (3D) geometry in which the total tissues of human cancer cells have been considered in the model. The time-dependent bio-heat equation has been used to calculate temperature distribution within the DNA/RNA of human cancer cells. The results show for spot size of ω=1.5 (mm), the energy of pulse can be increased to value of E = 0.5 (J) while the maximum of temperature DNA/RNA is 15°C. With this temperature for DNA/RNA of human cancer cells, the tissue is safe from thermal effect and its temperature exceeds rarely from 5°C to 10°C [1–19]. Furthermore, the time interval of temperature variations is less than 5 zeptosecond. In addition, Nd: YAG lasers must meet a number of criteria such as high reflection losses for highly reflecting mirrors or a well–defined transmission in certain wavelength range for output couplers and high optical quality include surface flatness, high roughness and also acceptable and reasonable resistance against high optical intensities. In this investigation, design and manufacturing of optical filters in Microwave, IR and UV–Vis regions for Nd: YAG lasers have been also studied. Moreover, effectiveness factors on laser damage threshold have been analysed and interesting results was obtained from this study **(Figures 1–3)**.

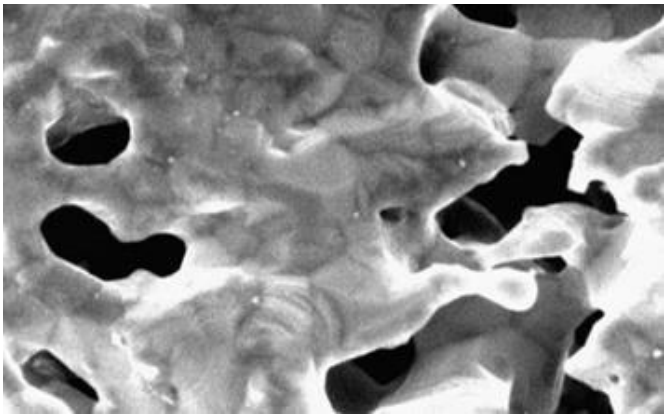

Figure 1 Interaction between DNA/RNA of human cancer cells and Nd: YAG laser in Microwave region.

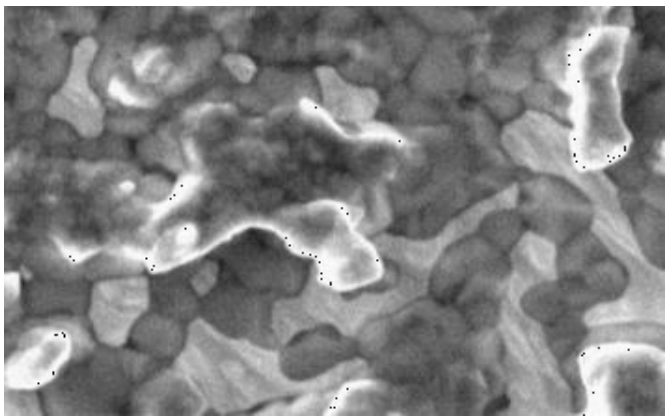

Figure 2 Interaction between DNA/RNA of human cancer cells and Nd: YAG laser in IR region.

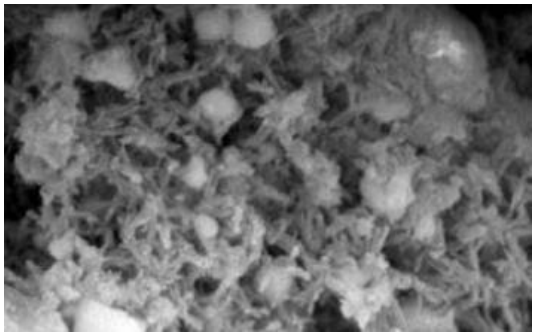

Figure 3 Interaction between DNA/RNA of human cancer cells and Nd: YAG laser in UV–Vis region.

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