AbstractID: 9566 Title: Modeling of Plasmonic Heating from Individual Gold Nanoshells for Near-Infrared Laser-Induced Thermal Therapy

Purpose: The goal of this study is to propose a new method to estimate thermal response of gold nanoshells presented in a tissue-like medium induced by near-infrared laser using a contribution of temperature elevation from the individual gold nanoshell at resonance frequency. **Method and Materials:** A cube was used for a geometrical model representing a volume of tissue containing gold nanoshells (1.0×10^8 nanoshells/*ml*). Two different mathematical models were investigated and compared. First, we develop a model based on calculation describing the light distribution from diffusion approximation of the transport theory and the rise in temperature of individual gold nanoshell induced by the photons reached at its site as a consequence of light spreading in the medium. The total increase in temperature at the position of interest is determined by entire contribution of rise in temperature from these individual gold nanoshells. While the same light distribution is used for the second model as for the first one the temperature response was calculated from a heat transfer equation using the finite element method with modified optical properties for the gold nanoshell contained tissue-like medium. **Results:** The peak temperatures from the two different methods agree well each other, even though the distributions of change in temperature are slightly different. **Conclusions:** The calculation of temperature distribution from the heat transfer equation is straightforward with the fine element method using the commercial package (COMSOL). However, obtaining the changed optical constant of medium containing gold nanoshells is not an easy task in routine clinical applications. On the other hand, the method with the heat generated by individual gold nanoshell uses the known optical constants of tissue without gold nanoshells, which makes this modeling more practical in a treatment planning for the clinical use.