Supporting Information for

Assessment of near-infrared penetration depth and photothermal efficiency of organic and inorganic materials in tissue-mimicking phantoms

Juyoung Hwang, Rim Mhamdi, Banyu Firdaus Soeriawidjaja, Min Chan Kim*, Astrini Pradyasti, Chung Thanh Pham, Kyu Hyun*, Hyun Jung Kim***, Songyi Lee, Mun Ho Kim** and Minseok Kwak†**

Department of Chemistry and Industry 4.0 Convergence Bionics Engineering, Pukyong National University *School of Chemical Engineering, Pusan National University, 2 Busandaehak-ro 63 beon-gil, Geumjeong-gu, Busan 46241, Korea **Department of Polymer Engineering, Pukyong National University, 45 Yongso-ro, Nam-gu, Busan 48513, Korea ***Department of Inflammation and Immunity, Lerner Research Institute, Cleveland Clinic, 9500 Euclid Ave., NE3, Cleveland, OH, 44195, USA

Keywords: Phantom; Photothermal therapy; Near-infrared; Indocyanine green; Gold nanorod

†Corresponding Author:
E-mail: mkwak@pukyong.ac.kr
Tel: (+82) 51-629-5595

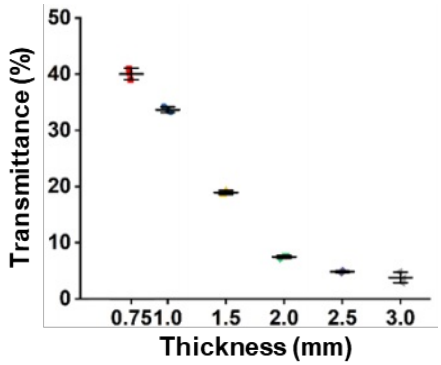

Figure S1 Transmittance of phantom with different thickness of lid at 808 nm.

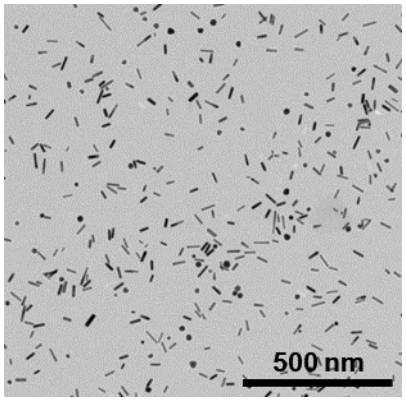

Figure S2 TEM image of gold nanorod (AuNR).

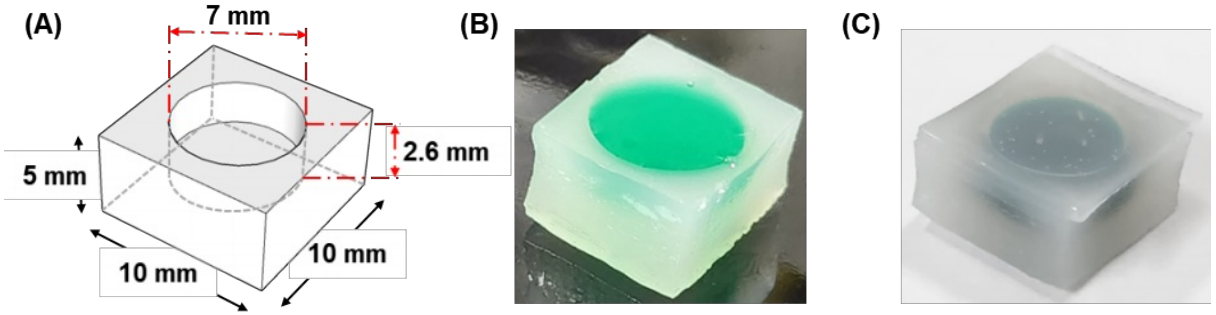

Figure S3 Phantom gel (A) measurement scale, actual image (B) without lid and (C) with lid of 0.75 mm thickness.

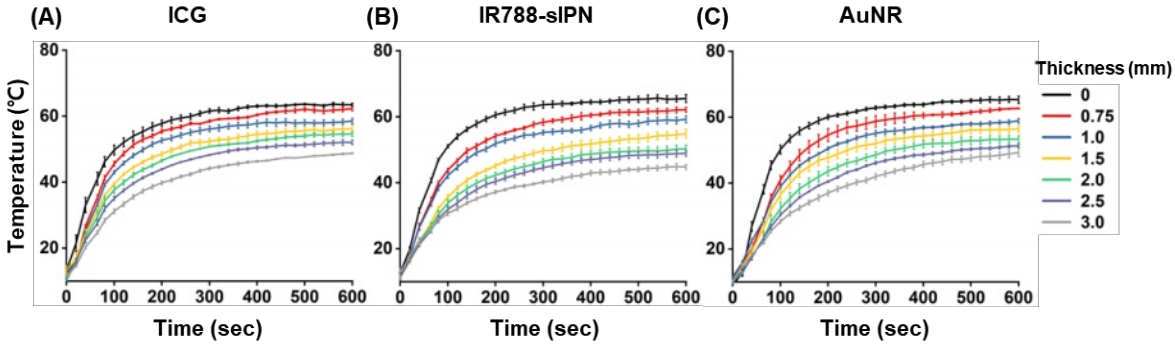

Figure S4 Temperature elevation of (A) ICG, (B) IR788-sIPN, (C) AuNR with different thickness of the lids (0, 0.75, 1.0, 1.5, 2.0, 2.5, 3.0 mm) under an 808 nm laser irradiation (1.5 W/cm^2).

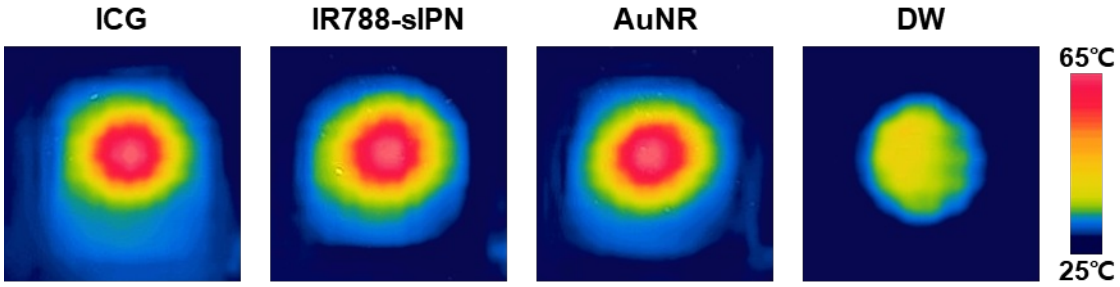

Figure S5 Infrared thermographic images of ICG, IR788-sIPN, AuNR, and deionized water (DW) solutions into the well under 808 nm laser irradiation (1.5 W/cm^2, 5 min).

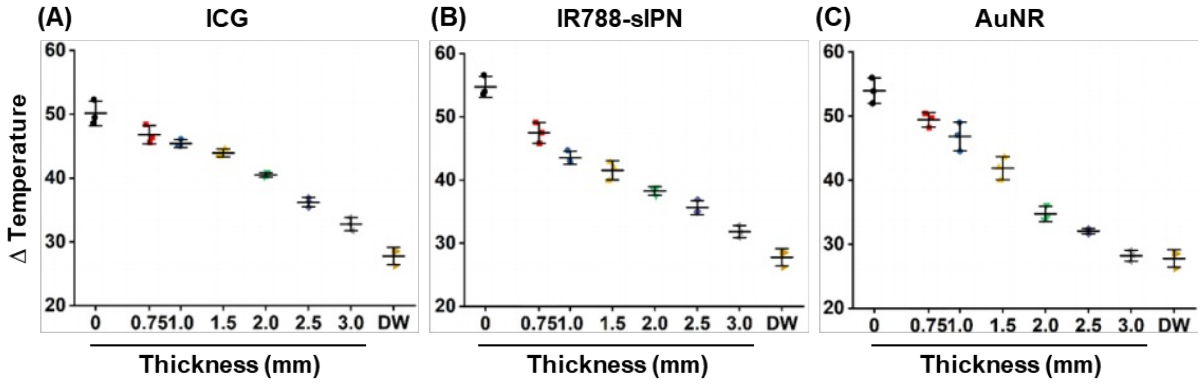

Figure S6 The temperature changes of (A) ICG, (B) IR788-sIPN, (C) AuNR with different thickness of the lids under an 808 nm laser irradiation (1.5 W/cm^2, 5 min).

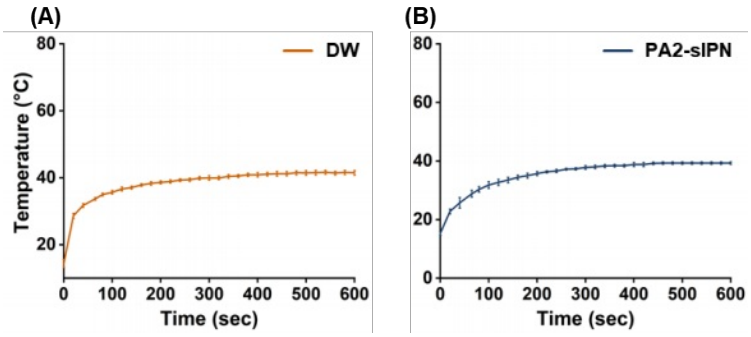

Figure S7 Temperature elevation of (A) DW and (B) PA2-sIPN under an 808 nm laser irradiation (1.5 W/cm^2).

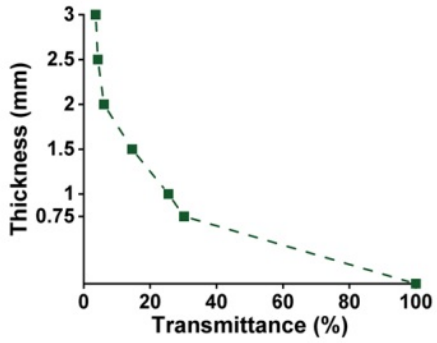

Figure S8 Transmittance at various thickness of phantom lid in percentage.

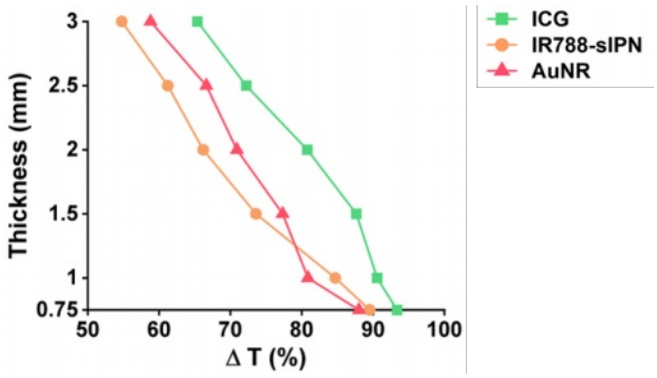

Figure S9 ΔT of every PTA at various lid thickness in percentage.

Table S1 Photothermal conversion efficiency (PCE) value references for the PTAs used in this work.

PTA Name	PCE (%)
ICG	14.7 – 15.1 [1, 2]
IR788-sIPN	18.6 [1]
AuNR	21.3 [1]

Step-by-step derivation of %transmittance vs. *%ΔT* equation

1. Make a graph from a dataset of %transmittance as x-axis and lid thickness as y-axis (as shown in Figure S8).

2. The resulting graph should exhibit exponential decay model, which satisfies:

$$d = a_{Transm}\left(e^{b_{Transm} \times \%Transm}\right)$$

3. Next, make another graph from a dataset of *%ΔT* of PTA as x-axis and lid thickness as y-axis (as shown in Figure S9).

4. The resulting graph should exhibit linear model with an equation of:

$$d = \left(a_{PTA} \times \%\Delta T\right) + b_{PTA}$$

5. Since both these two equations (step point 2 & 4) represent the same thing as y-axis, which is lid thickness (*d*), we can combine both equation:

$$\left(a_{PTA} \times \%\Delta T\right) + b_{PTA} = a_{Transm}\left(e^{b_{Transm} \times \%Transm}\right)$$

6. By rearranging the equation in step 5, finally we can get:

$$\%\Delta T = \frac{a_{Transm}\left(e^{b_{Transm} \times \%Transm}\right) - b_{PTA}}{a_{PTA}}$$