

Supporting Information

Build an Implanted “Arsenal”: Detachable Microneedles for NIR-triggered Cancer Photothermo-chemotherapy

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Photothermal Conversion Efficiency Calculation of PB NCs

To evaluate the photothermal conversion efficiency (PCE), the temperature variations of PB NCs solution (20 µg/mL) were recorded upon 808 nm laser irradiation (1.6 W/cm²) for 10 min to achieve the maximum steady-state temperature. Then the solution was naturally cooled to room temperature. Thus, PCE (η) can be calculated referring to the following Equation (1):

$$\eta = \frac{hA(\Delta T_{max,Mix} - \Delta T_{max,H_2O})}{I(1 - 10^{-A_{808}})} \quad (1)$$

Where h represents the heat transfer coefficient; A denotes the surface area of the container, $\Delta T_{max,Mix}$ (25.4°C) and $\Delta T_{max,H_2O}$ (3.5°C) indexes the temperature change of the PB NCs solution and solvent (water) at the maximum steady-state temperature, respectively, I is the laser intensity (1.6 W/cm²), and A_{808} is the absorbance of PB NCs solution at 808 nm (0.31). In this equation, hA is unknown. To calculate hA , θ is introduced (2):

$$\theta = \frac{T - T_{Surr}}{T_{Max} - T_{Surr}} \quad (2)$$

Where T_{Surr} and T_{Max} represents the environment and maximum temperature during

cooling period. And hA can be calculated referring to the following Equation (3):

$$t = -\frac{m_s C_w}{hA} \ln(\theta) \quad (3)$$

Where m_s and C_w denotes the solution mass (1 g) and heat capacity (4.2 J/g) of pure water, respectively.

According to the Equation (1), the PCE of PB NCs is calculated to be 24.7%.

Cell Cytotoxicity

The cell viability was determined by CCK-8 assay. To obtain soaking solution, 10 g 0.1wt% PB NCs loaded PCL was soaked in 5 mL PBS for 24 h. KB cells were seeded into a 96-well plate at 8000 cells per well and after 12 h the cell culture medium was replaced with fresh cell culture medium containing different volumes of soaking solution. 48 h later, 20 μ L of CCK-8 was added to each well for another 4 h. Finally, the formazan absorbance was measured by a microplate Bio-Rad reader (Thermo Fisher Scientific) at 450 nm. Data were presented as average \pm SD (n = 5).

Supplementary Figures

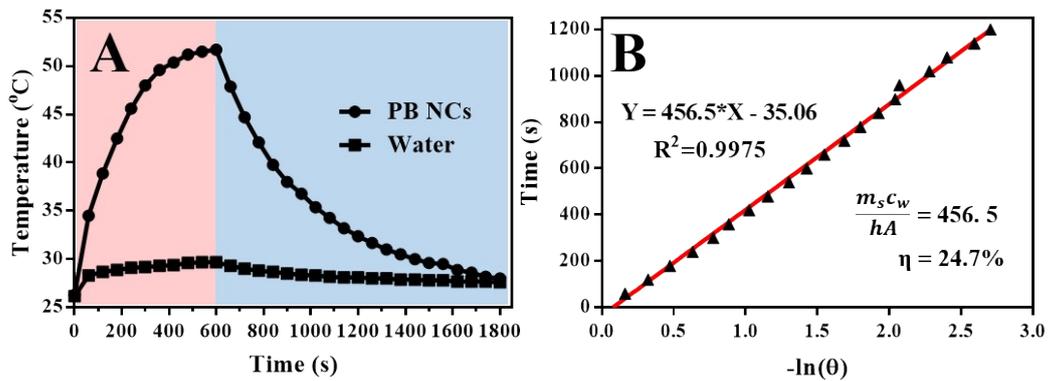


Fig.S1 Calculation of Photothermal Conversion Efficiency of PB NCs. (A) The temperature variety of PB NCs solution (20 μ g/mL) and pure water response to 808 nm NIR irradiation (1.6 W/cm²) on and off in period of 1800 s. (B) Linear time data versus $-\ln(\theta)$ obtained from the cooling period of NIR light off.

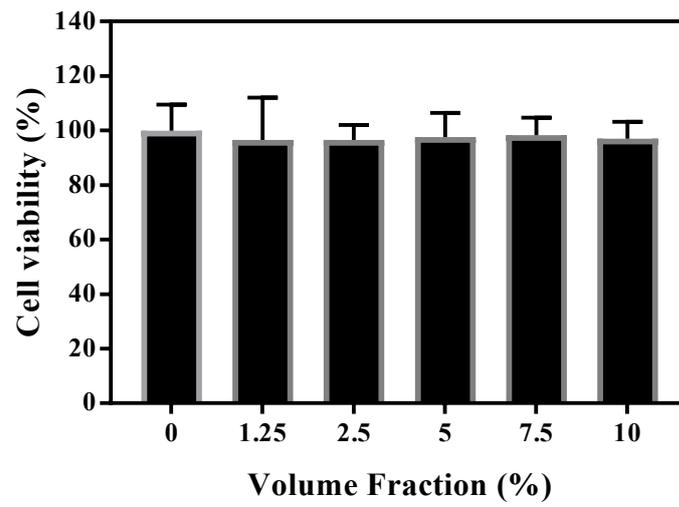


Fig.S2 Cytotoxicity of KB cells incubated with different volume fraction of soaking solution from 0.1wt% PB NCs loaded PCL.