Supporting Information

Materials.

L-α-phosphatidylcholine (95%) (Egg, Chicken) (Lecithine, Egg PC) was purchased from Avanti Polar Lipids and 1,2-distearoyl-sn-glycero-3-phosphoethanolamine-N-[amino poly(ethylene glycol)-2000] (ammonium salt)) (DSPE-PEG_{2000}) from NOF America Corporation, SUNBRIGHT. The lipids were used without further purification. Nickel-bis(dithiolene) complexes $Ni8C_{12}$[1] and Ni8PEG[2] have been prepared as previously reported.

Methods.

Egg PC/DSPE-PEG_{2000} Liposome preparation. Stock solutions of Egg PC and DSPE-PEG_{2000} were prepared in chloroform (10 mg/mL). In a round bottom flask, 1.8 mL of the Egg PC solution (18 mg) were added to 0.2 mL of DSPE-PEG_{2000} solution (2 mg). The Egg PC/DSPE-PEG_{2000} (9:1 w:w) mixture is stirred for 30 min at room temperature. Then, the chloroform was removed at 50 °C by vacuum rotary evaporation under reduced pressure (300 mbar) to form a homogenous lipid film on the wall of the round bottom flask. This lipid film was dried using a high vacuum ramp for 3 hours to insure the removal of any residual chloroform trace. The thin lipid film (20 mg of total mass) was hydrated at room temperature with 2 mL of ultrapure water (18 MΩ) and then stored 48 hours in the fridge, time during which the film gently peels off. The obtained turbid suspension was exposed to five cycles of sonication (5 min ultrasound on followed by 5 min off, frequency 35 kHz). The suspension were filtered by centrifugation (16 000 rpm, 10 min) to remove the free lipids that would not have been incorporated inside liposomes. For this purpose, filters (VWR ultrafiltration unit, 0.5mL, 30KDa) retaining the liposomes but not the free lipids were used. The liposomes were finally redispersed in milliQ water to have a final volume of 2 mL.

[1] K. Otha, Y. Inagaki-Oka, H. Hasebe, I. Yamamoto, Polyhedron 2000, 19, 267-274.
[2] K. Mebrouk, F. Chotard, C. le Goff-Gaillard, Y. Arlot-Bonnemains, M. Fourmigue, F. Camerel, Chem. Commun. 2015, 51, 5268-5270.

Lp-Ni8C$_{12}$ preparation. 1 to 6 mL of a 1 mg/mL solution of the Ni8C$_{12}$ complex in chloroform (1 mg) was added to mixture containing 1.8 mL of a solution at 10 mg/mL Egg PC solution (18 mg) and 0.2 mL of a 10 mg/mL DSPE-PEG$_{2000}$ solution (2 mg), both prepared in chloroform. The mixture was stirred for 30 minutes and then the chloroform was removed under reduced pressure. The obtained Egg PC/DSPE-PEG$_{2000}$/Ni8C$_{12}$ lipid film was dried at vacuum for 3 hours and then hydrated with 2 mL of water. After 48 hours of hydration, the suspension was sonicated 5 times for 5 min (frequency 35 kHz). The solution was then centrifuged through a filter (VWR ultrafiltration unit, 0.5mL, 30KDa) in order to remove excess of unencapsulated product. The liposomes were redispersed in 2 mL of milliQ water to provide a green Lp-Ni8C$_{12}$ suspension.

Lp-Ni8PEG preparation. The lipid film of the Egg PC/DSPE-PEG$_{2000}$ Liposome was directly hydrated with 2 mL of a 4 mg/mL Ni8PEG aqueous solution (40 w% relative to the mass of lipid). After 48 hours of hydration, the same purification procedure to that for the Lp-Ni8C$_{12}$ was used. A green suspension of Egg PC/DSPE-PEG$_{2000}$ liposomes containing Ni8PEG complexes in the liquid core was obtained.

CF doped Lp-Ni8C$_{12}$ preparation. 1 mL of a 1 mg/mL solution of the Ni8C$_{12}$ complex in chloroform (1 mg) was added to mixture containing 1.8 mL of a solution at 10 mg/mL Egg PC solution (18 mg) and 0.2 mL of a 10 mg/mL DSPE-PEG$_{2000}$ solution (2 mg), both prepared in chloroform. The mixture was stirred for 30 minutes and then the chloroform was removed under reduced pressure. The obtained Egg PC/DSPE-PEG$_{2000}$/Ni8C$_{12}$ lipid film was dried at vacuum for 3 hours and then hydrated with 2 mL of a saturated aqueous solution of carboxyfluorescein (CF). After 48 hours of hydration, the suspension was sonicated 5 times for 5 min (frequency 35 kHz). The solution was then centrifuged through a filter (VWR ultrafiltration unit, 0.5mL, 30KDa) in order to remove excess of unencapsulated lipids and CF. The liposomes were redispersed in 2 mL of milliQ water to provide a green Lp-Ni8C$_{12}$ suspension, directly freeze to avoid CF release.

DLS experiments. The liposomes were analyzed by dynamic light scattering (DLS) with a Delsa™ Nano Beckman Coulter apparatus or a Malverne Zetasizer nano-ZS at 25 °C for hydrodynamic diameter and polydispersity.

Cryo-TEM experiments. Specimen grids were prepared using an automatic plunge freezer (EM GP, Leica) regulated at 20 °C and 95% humidity. Four microliter specimens were deposited at the surface of holey carbon coated grids (Quantifoil R 2/2), blotted for 0.8 to 1.4 sec and quickly plunged into liquid ethane. Grids were transferred to a cryo-holder (Gatan 626) and were observed at -176 °C using a 200 kV electron microscope (Tecnai G2 T20 Sphera, FEI) equipped with a LaB6 filament and a 4k x 4k CCD camera (USC4000, Gatan). Images were acquired in low-electron dose conditions at 29,000 X nominal magnification, corresponding to a pixel size of 0.39 nm.

UV-vis-NIR titration. UV-Vis-NIR absorption spectra in solution were recorded on a Shimadzu UV3600 Plus spectrophotometer. Samples were placed in 1 cm path length quartz cuvettes.

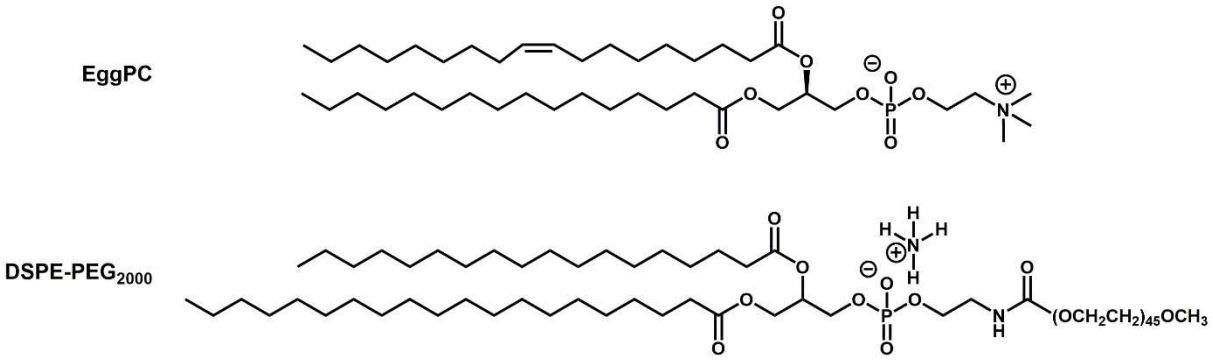
Photothermal studies. For the photothermal studies, 1 mL of liposome suspensions were irradiated through a quartz cuvette with a 940 nm-wavelength semiconductor laser (BWT Beijing LTD) for 10 min. The power intensity of the laser could be adjusted externally (0-10 W). The output power was independently calibrated using an optical power meter. A thermocouple with an accuracy of ± 0.1 °C connected to an Agilent U1253B multimeter was inserted into the solution. The thermocouple was inserted at such a position that the direct irradiation of the laser was avoided. The temperature was measured every 1s.

DSC experiments. Differential scanning calorimetry (DSC) was carried out by using NETZSCH DSC 200 F3 instrument equipped with an intracooler. DSC traces were measured at 10 °C/min between 5 °C and 80 °C.

Measurement of the CF release from the Lp-Ni8C$_{12}$. The CF release was directly studied in a quartz cuvette using a home-made dialysis system. For this, a dialysis membrane with a cut-off threshold of 3500 Da was immersed in milliQ water for 30 minutes and then rinsed with clean water. The dialysis film was cut to the desired size and then placed on a 100 µL Eppendorf tip of which has been cut to 2.9 cm from the top. The dialysis membrane is held on the tip with a plastic paraffin film (Parafilm). The system is then introduced into a quartz cuvette having a circular aperture and containing 2.7 mL of water. 150 µL of the liposome suspension was then placed in the modified tip. The fluorescence spectra for the CF release in water were recorded at room temperature using a fluorimeter FL-920 Edimburg. The excitation wavelength was set at 495 nm and the emission was measured between 500 and 650 nm. For measurements under laser irradiation, the samples were irradiated at 5 W/cm^2 for a given time by the top of the quartz cuvette.

Cell culture. The HeLa and MDA cells were routinely cultured in RPMI supplemented with 10 % fetal bovine serum (FBS), 100 U mL^{-1} penicillin and 100 µg.mL^{-1} streptomycin at 37 °C in a humidified 5 % CO_2 atmosphere.

In vitro evaluation of cytotoxicity. The effect of the liposomes on cell growth was assayed in sterile 96 wells plates (Micortest^{TM}-96-Becton Dickinson). The cells were seeded at 2500 cells per well of full medium (100µl/well). The liposome suspensions at the appropriate concentration (50, 125, 250 µg.mL^{-1}) were added 24 hours after seeding for further 24 h. After exposure to the liposomes, cell growth was determined by measuring the formazan formation, from thiazolyl-blue-tetrazolium-bromide (MTT- Sigma).[1] The formazan crystals of blue color are solubilized with DMSO. The spectroscopic absorbance of formazan was measured at wavelength of 570 nm using a BMG Labtech FLUOstar Optima plate reader. Triplicates were done for each treatment group.



Scheme S1. Chemical structure of EggPC and DSPE-PEG_{2000} molecules.

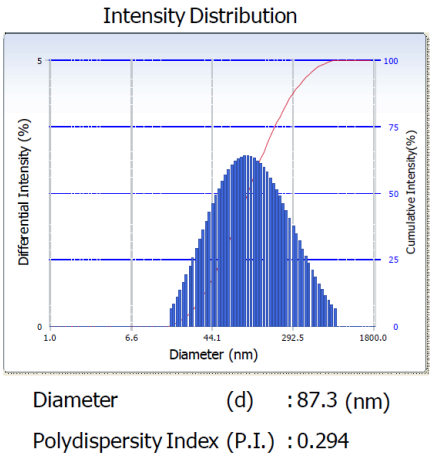


Figure S1. Dynamic light scattering results obtained on the suspension of Egg PC/DSPE-PEG_{2000} liposomes (9:1 w:w).

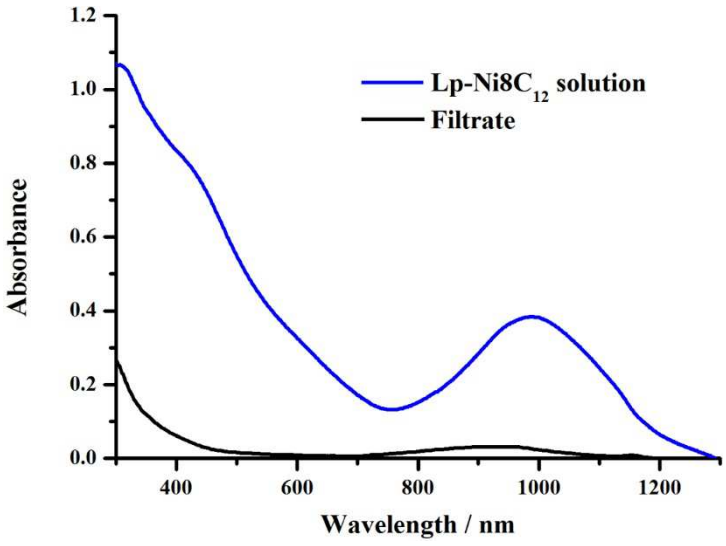


Figure S2. UV-vis-NIR absorption spectra of the filtrate and of the purified Lp-Ni8C_{12} aqueous suspension (C = 10 mg/mL of lipids) (ε_{Ni8C12} = 14 190 L.mol^{-1}.cm^{-1}).

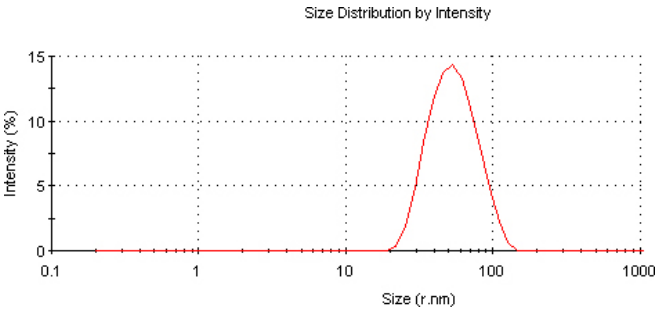


Figure S3. Dynamic light scattering results obtained on the suspensions of Lp-Ni8C_{12} with 5 w% of complexes (P.I. = 0.263).

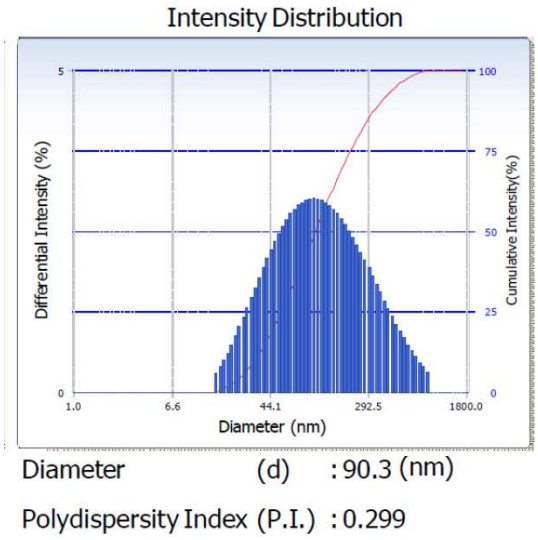


Figure S4. Dynamic light scattering results obtained on the suspensions of Lp-Ni8PEG with 13 w% of complexes.

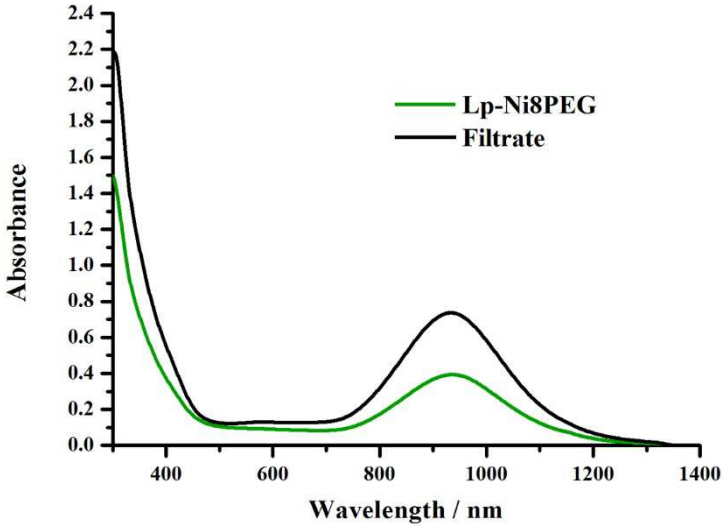


Figure S4. UV-vis-NIR absorption spectra of the filtrate and of the purified Lp-Ni8PEG aqueous suspension (C = 500 µg/mL) (ε_{Ni8PEG} = 14 200 L.mol^{-1}.cm^{-1}).

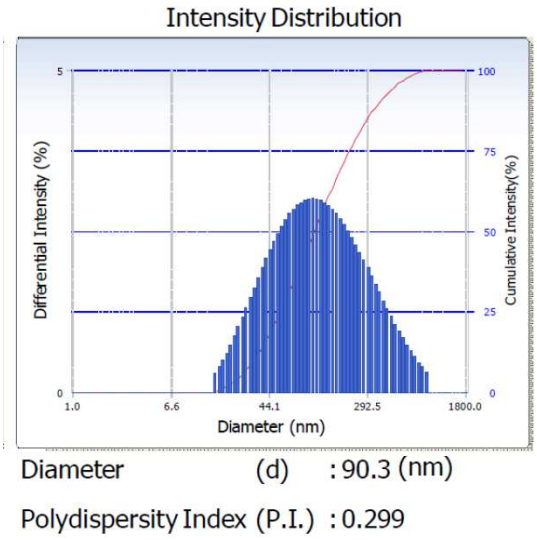


Figure S5. Dynamic light scattering results obtained on the suspensions of Lp-Ni8PEG with 13 w% of complexes.

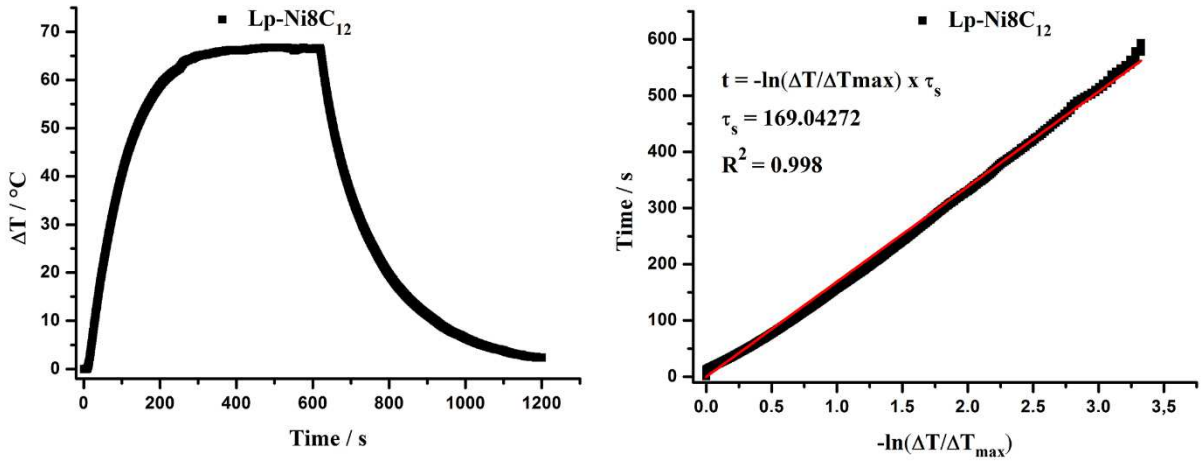


Figure S6. (Left) Temperature profile of the suspension of Lp-Ni8C_{12} in water when illuminated with a 940 nm laser (5 W.cm^{-2}) during 10 min and after turning off of the laser during 10 min; (Right) time constant for heat transfer is determined by applying the linear time from the cooling period (from 600 to 1200 s) versus negative natural logarithm of the driving force temperature.

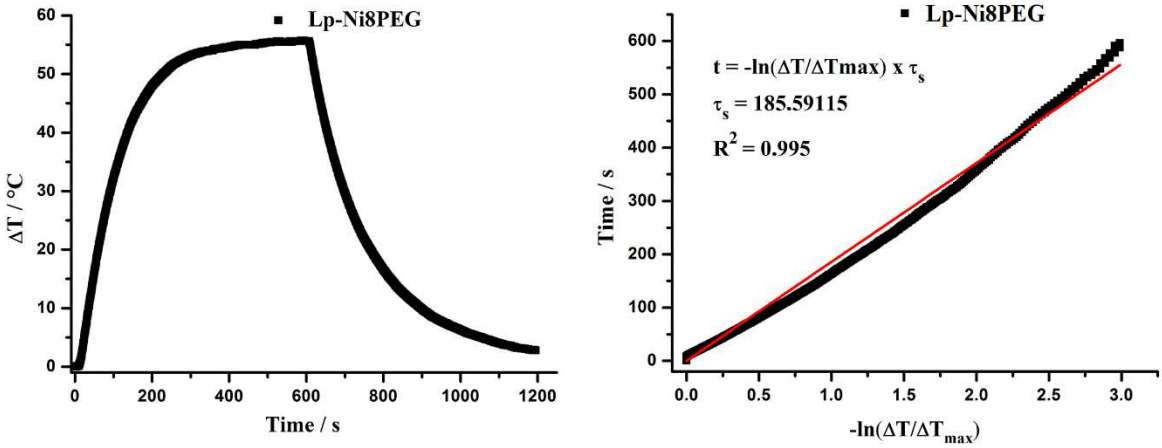


Figure S7. (Left) Temperature profile of the suspension of Lp-Ni8PEG in water when illuminated with a 940 nm laser (5 W.cm^{-2}) during 10 min and after turning off of the laser during 10 min; (Right) time constant for heat transfer is determined by applying the linear time from the cooling period (from 600 to 1200 s) versus negative natural logarithm of the driving force temperature.

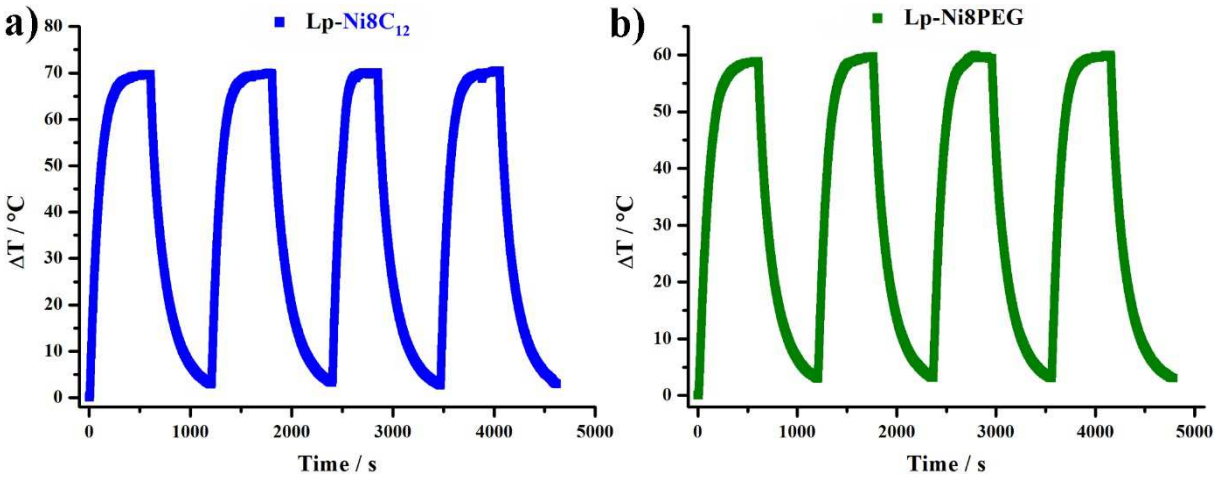


Figure S8. Stability measurement of Lp-Ni8$C_{12}$and Lp-Ni8PEG after four heating cycles under 940 nm laser irradiation (5 W.cm^{-2}, 10 min ON / 10 min OFF).

$$\eta = \frac{(hS\Delta T_{max} - Q_{eau})}{I(1-10^{-A_{940}})} \quad \text{(Eq 3)}$$

	Lp-Ni8C_{12}	Lp-Ni8PEG
hS $(m_{eau}Cp_{eau})/\tau_s$	0.025 J.s^{-1}	0.022 J.s^{-1}
ΔT_{max}	66.6 °C	55.6 °C
$\Delta T_{max\ Lp\text{-}vide}$	30.0 °C	30.0 °C
I	3.93 W	3.93 W
A_{940}	1.056	4.58

Table S1. Calculation of the photothermal efficiencies of Ni8C_{12} and Ni8PEG encapsulated inside Egg PC/DSPE-PEG_{2000} liposomes (values extracted from the temperature profiles).

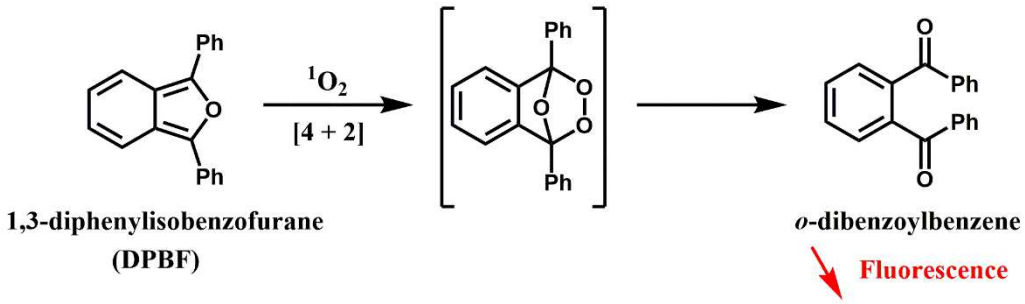


Figure S9. Illustration of the chemical reaction of DPBF with singlet oxygen ($^1O_2$).

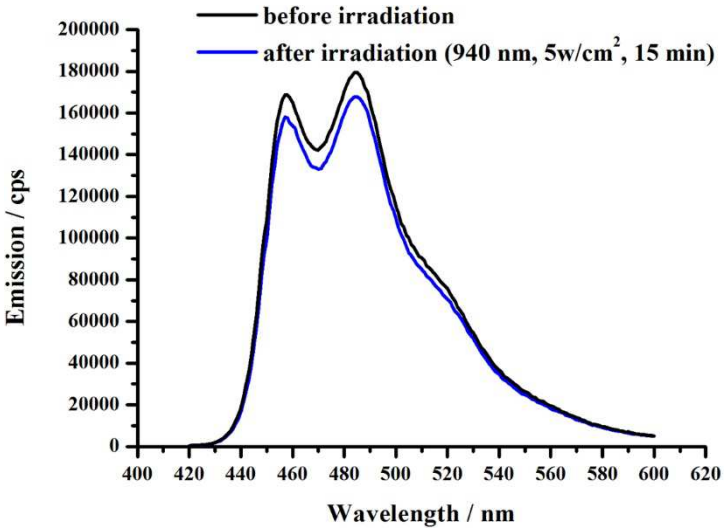


Figure S10. Fluorescence spectra of a DPBF/Ni8C$_{12}$ mixture of recorded before and after irradiation (940 nm, 5 W/cm^2, 15 min).

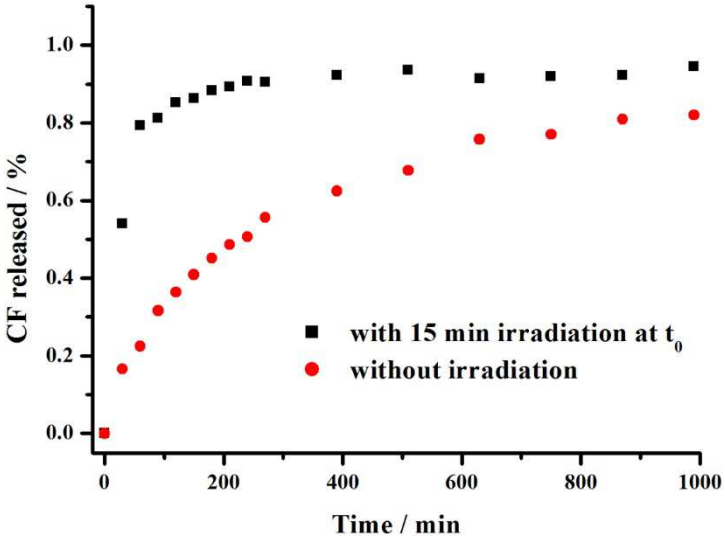


Figure S11. Percentage of CF released from Lp-Ni8C_{12}-CF without and with laser irradiation (940 nm, 5W/cm^2, 15 min at t_o)

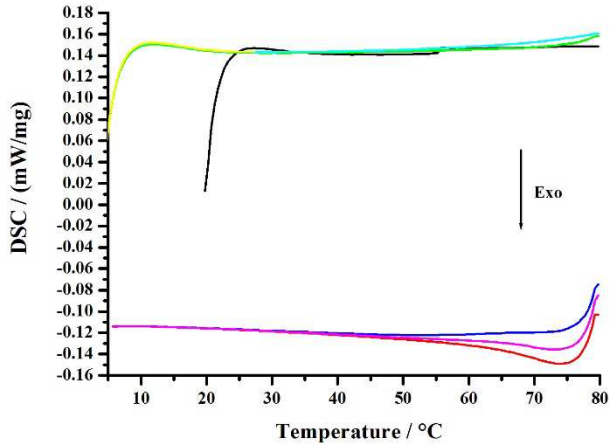


Figure S12. DSC traces measured on a concentrated suspension of Lp-Ni8C_{12} in water (100 mg/mL).

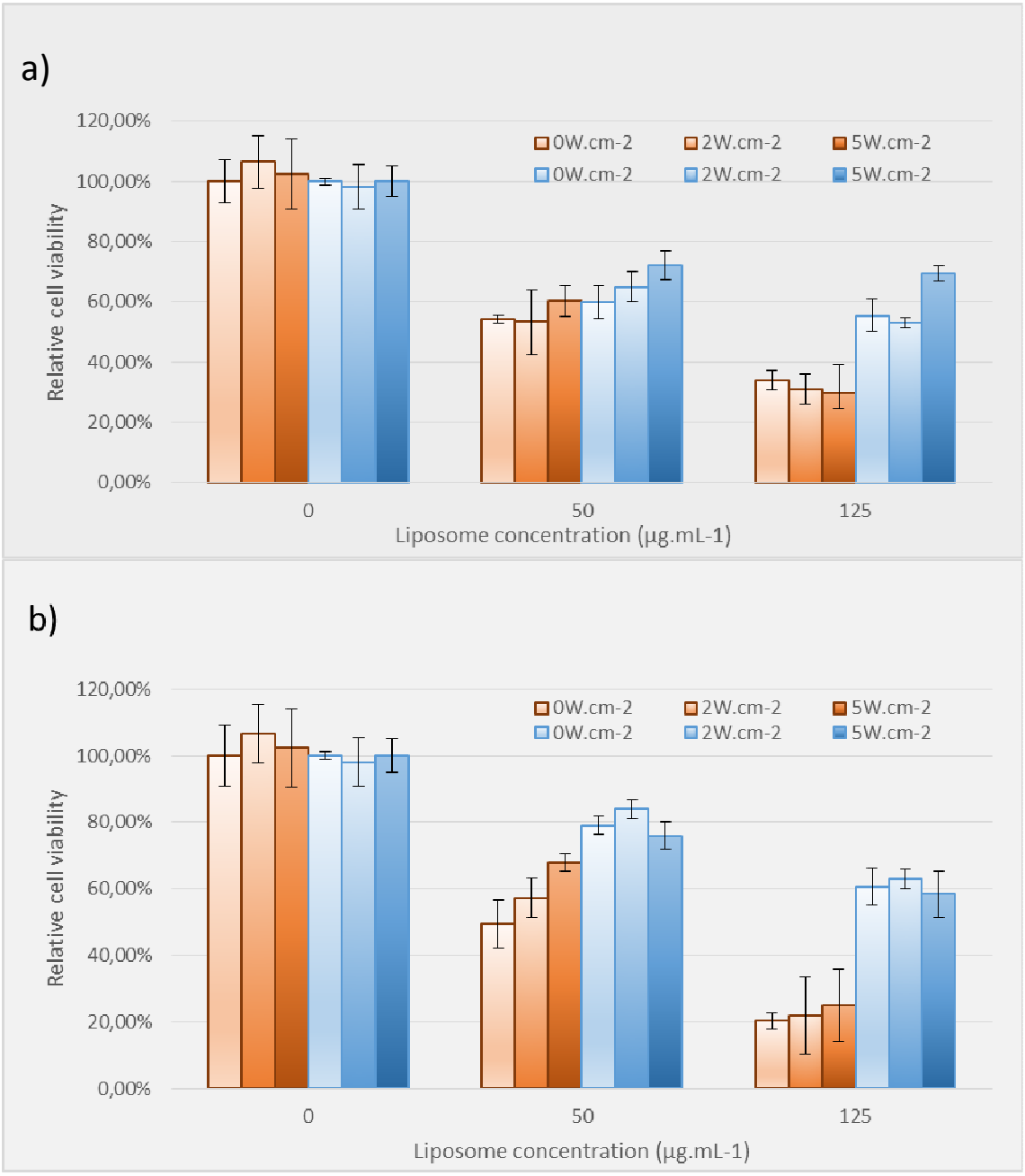


Figure S13. a) Relative Cell viability of HeLa (orange) and MDA (blue) cells incubated with different concentrations of Lp-Ni8C$_{12}$ (5w%/lipid) under 0, 2 and 5 W.cm^{-2} laser irradiation at 940 nm; b) Relative Cell viability of HeLa (orange) and MDA (blue) cells incubated with different concentrations of empty liposomes under 0, 2 and 5 W.cm^{-2} laser irradiation at 940 nm. (These experiments have not been performed at 250 µg.mL^{-1} of liposomes since this concentration was previously found to be too toxic).

[1] T. Mosmann, Journal of lmmunological Methods, 1983, **65**, 55.