Photostability and repeatability

All of the optical experiments were repeated at least three times, and the results measured in different times were accordance with each other. The dependence of emission intensity on exposure time indicates that the photostability of the composites film is good, and the relative intensity change is less than 10 %.

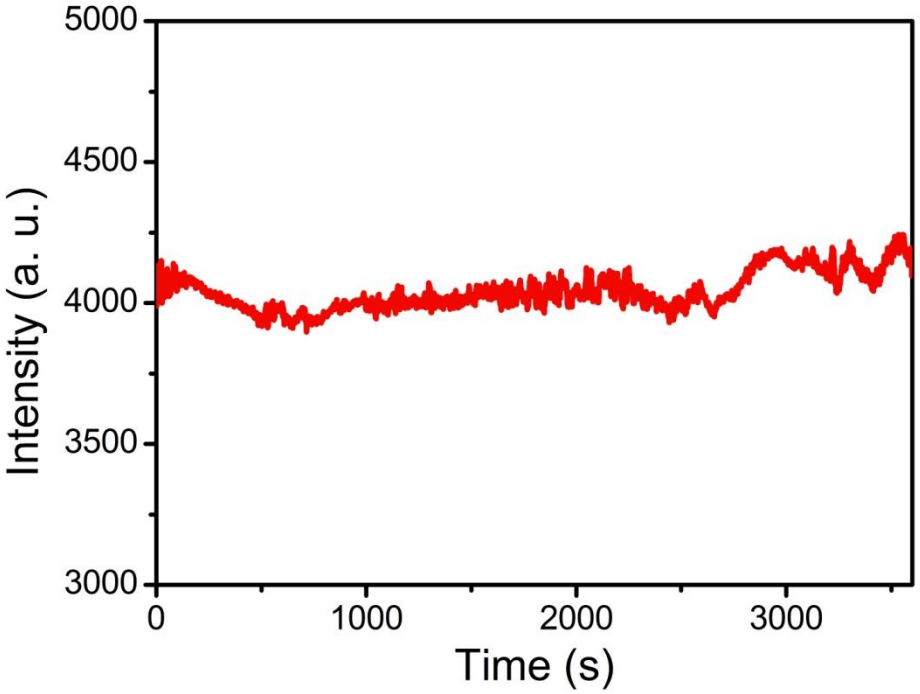

Fig. S1 Emission intensity of Tm^{3+} (λex=980 nm, λem=450 nm) of PMMA/$NaYF_4$:Yb^{3+}, Tm^{3+} composites as a function of exposure time.

In Vitro toxicity

Human lung cancer cells (A549, suspended) were cultured in Dulbecco's modified Eagle's medium (DMEM) supplemented with 10% fetal bovine serum (FBS) at 37 °C in a 5% CO_2 incubator. PMMA OPCs or PMMA/$NaYF_4$:Yb^{3+}, Er^{3+} composites film on the glass substrate (2 cm^2/piece) through UV irradiation were preplaced in the bottom of a 12-well plate. Then 1 mL cell suspension (1.6×10^5 cells/mL) of A549 cells was seeded in per well and exposed to PMMA OPCs or PMMA/$NaYF_4$:Yb^{3+}, Tm^{3+} composites and cells were incubated for additional periods ranging from 2 to 24 h. Untreated cells were used as control (100 % viability). At the end of exposure, 20 μL of cell suspension was removed and mixed with the same volum of 0.4% trypan blue solution. Following cell staining for 2 min, an aliquot (10 μL) of stained cell suspension was pipetted onto a hemocytometer and counted for cell number. The obtained cell viability was expressed as relative of to control. The result shows that the toxicity of the PMMA OPCs and the PMMA/$NaYF_4$:Yb^{3+}, Er^{3+} composites is very small (see Fig S2).

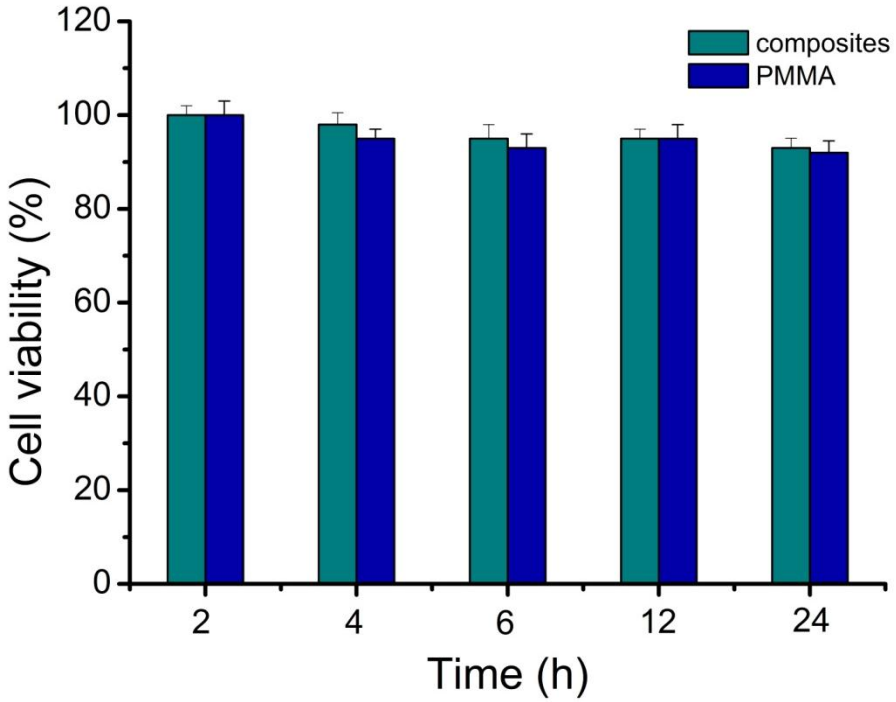

Fig. S2 Cell viability of PMMA/$NaYF_4$:Yb^{3+}, Tm^{3+} composites and PMMA OPCs on A549 cells for different hours.

Solution stability of PMMA/$NaYF_4$:Yb^{3+}, Er^{3+} composites

The leaching test was performed. It shows that after being immersed in aqueous solution for 24 hours, the composite film still maintains its original dense structure without dropping off. And the transmittance spectra shows that the PSB of the composites films barely changes (see Fig. S3).

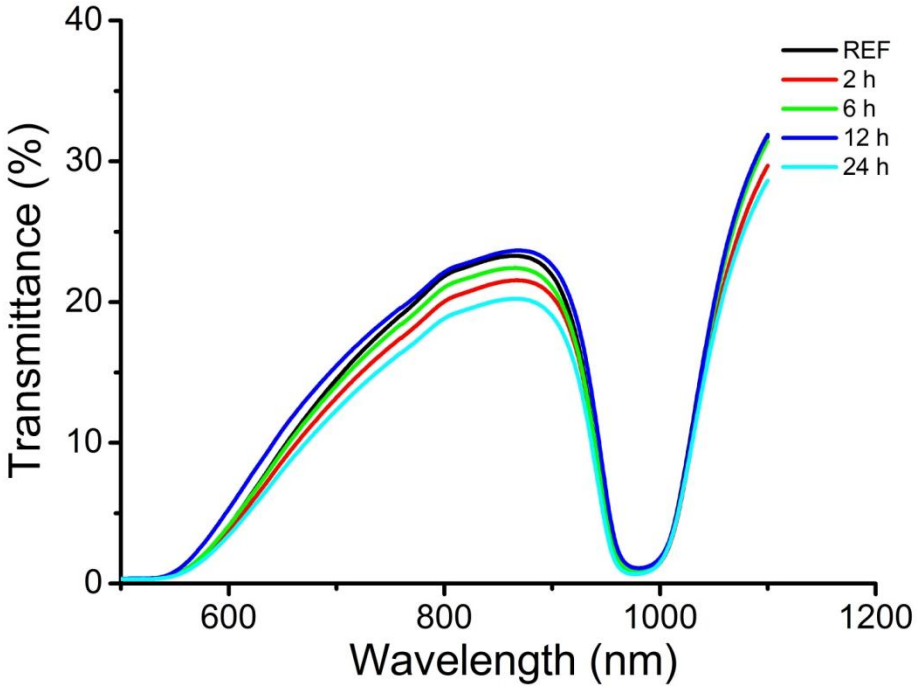

Fig. S3 Transmittance spectra of PMMA/$NaYF_4$:Yb^{3+}, Tm^{3+} composites after immersed in aqueous solution for different hours.