Supporting Information

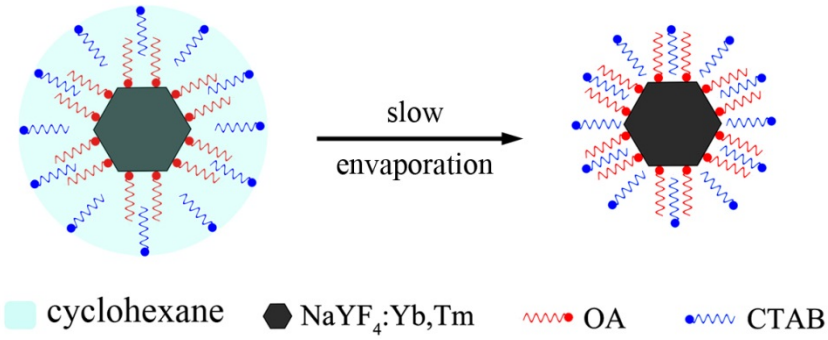
Directly Coat TiO_2 on Hydrophobic $NaYF_4$:Yb,Tm Nanoplates and Regulate Their Photocatalytic Activities with the Core Size

Wankui Su,[ab] Mengmeng Zheng,[a] Lei Li,[b] Kun Wang,[b] Ru Qiao,[a] Yijun Zhong,[a] Yong Hu,[a] and Zhengquan Li*[ab]*

[a]Institute of Physical Chemistry and [b]Department of Materials Physics, Zhejiang Normal University, Jinhua, Zhejiang 321004, P. R. China

Experimental

Synthesis of $NaYF_4$:Yb,Tm nanoplates. $NaYF_4$:25%Yb, 0.3%Er nanoplates of 50 nm in diameter were synthesized following this protocol: YCl_3 (0.747 mmol), $YbCl_3$ (0.25 mmol) and $TmCl_3$ (0.003 mmol) were mixed with 4 mL oleic acid (OA) and 16 mL octadecene (ODE) in a 50 ml flask. The solution was then heated to 160 ºC to form a homogeneous solution and cooled down to room-temperature. 10 mL of methanol solution containing NaOH (2.5 mmol) and NH_4F (4 mmol) were added into the flask and slowly heated to evaporate methanol. After complete removal of methanol, the flash was degassed at 100 ºC for 10 min, heated to 300 ºC and maintained at this temperature for 1 h under argon atmosphere. After the solution was cooled down naturally, $NaYF_4$:Yb,Tm nanoplates were precipitated from the solution with ethanol. Synthesis of $NaYF_4$:Yb,Tm nanoplates with other sizes were performed with a similar protocol by varying the reaction time and amount of oleic acids. Detailed parameters are list as follows: 1 h and 3 mL OA for 100 nm nanoplates; 1.5 h and 3 mL OA for 130 nm nanoplates; 1 h and 5 mL OA for 30 nm nanoplates.



Scheme S1. Schematic illustration of the preparation of CTAB-modified $NaYF_4$:Yb,Tm nanoplates with reverse-micelle method.

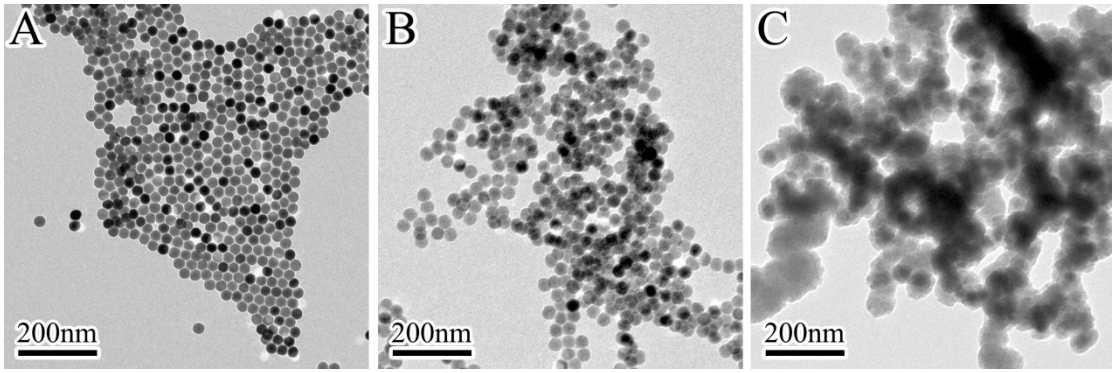


Figure S1. TEM images of 30 nm $NaYF_4$:Yb,Tm nanoplates at different synthetic stages: (A) primitive nanoplates; (B) CTAB-modified; (C) after TiO_2 coating and annealing.

Samples	κ under different irradiation bands		
	UV	NIR	UV/VIS/NIR
P25	0.04292	0	0.04306
NP30	0.0517	0.00465	0.05751
NP50	0.08342	0.00759	0.10722
NP100	0.05103	0.00522	0.06714
NP130	0.04363	0.00501	0.05492

Table S1. Apparent rate constants of P25 and $NaYF_4$:Yb,Tm@TiO_2 NPs with varied core sizes under different irradiation bands. Above data indicate that NPs with 50 nm core size have the best photocatalytic performance in each band than other samples.