Supporting Information

Dynamic tailorable local luminescence patterns on single upconversion fluoride microcrystals via in situ oxidation through laser irradiation

Dangli Gao,*[ab] Dan Zhao,[a] Hong Xin,[a] Anjiang Cai,[b] Xiangyu Zhang[c]

a. College of Science, Xi'an University of Architecture and Technology, Xi'an, Shaanxi 710055, China

b. Shaanxi Key Laboratory of Nano Materials and Technology, Xi'an, Shaanxi 710055, China

c. College of Science, Chang'an University, Xi'an, Shaanxi 710064, China

Corresponding Authors

* gaodangli@163.com;

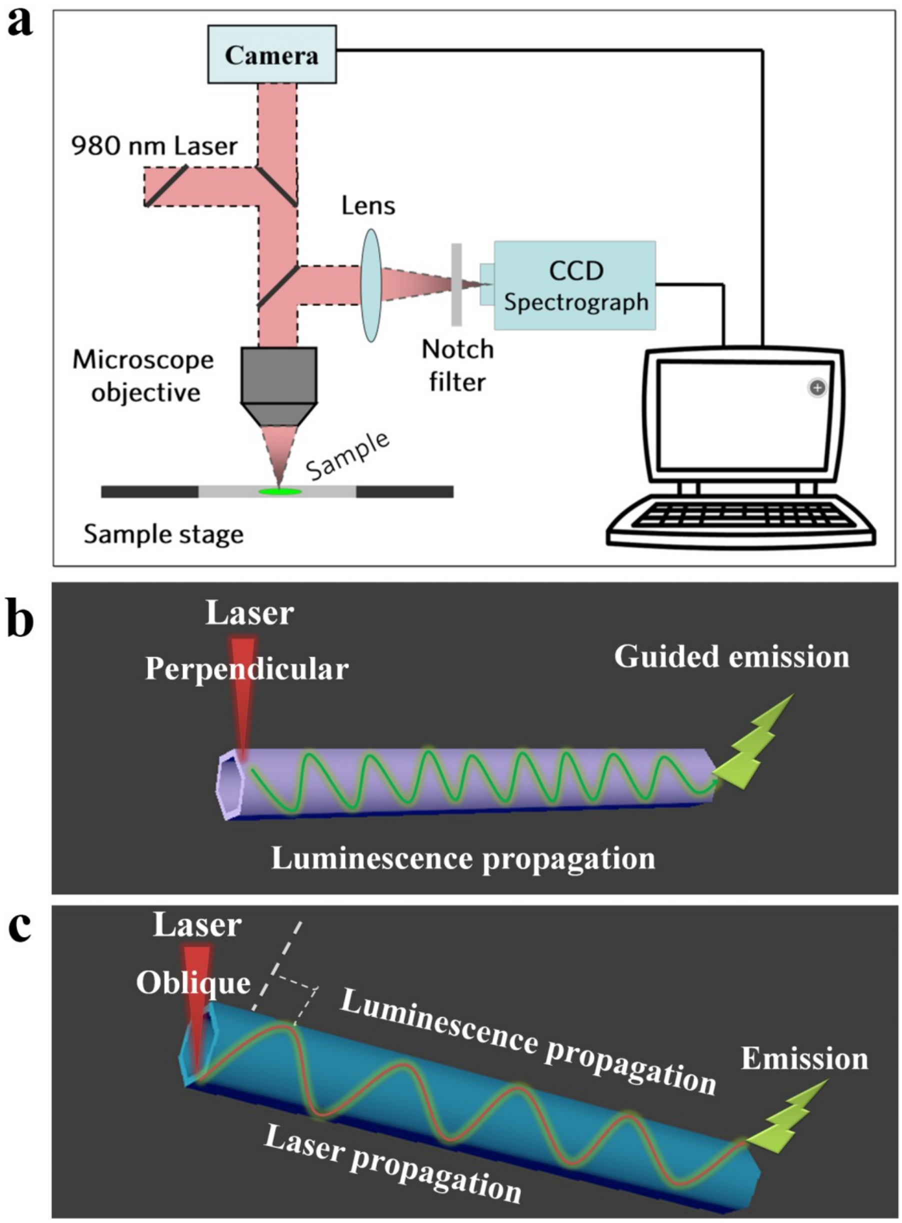

Figure S1 Specific single-particle confocal experimental devices (a), schematic of excitation approach for the spot-excitation approach (b) and the waveguiding-excitation approach (c).

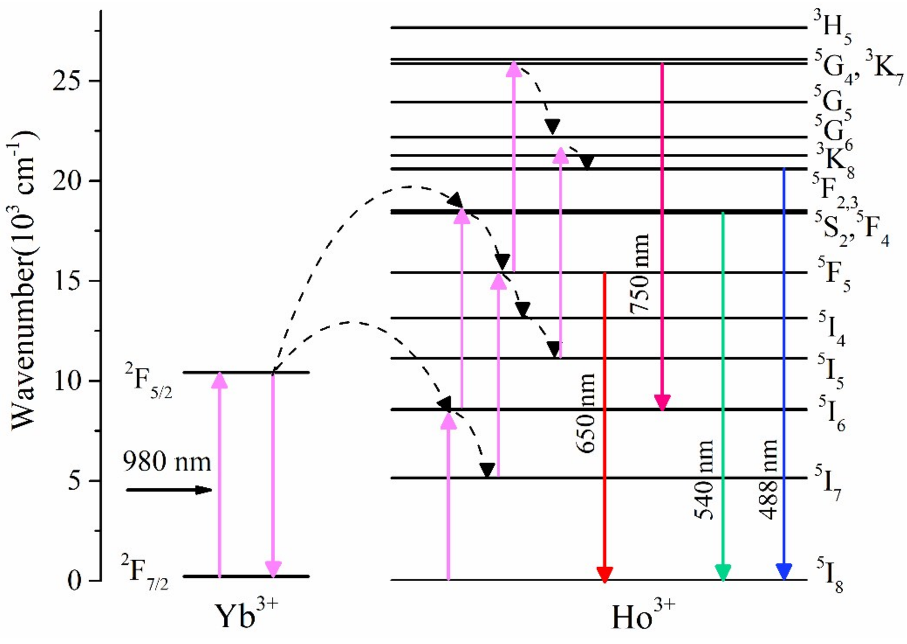

Figure S2 Simplified energy level diagrams of Yb^{3+} and Ho^{3+} ions and proposed upconversion mechanisms for $NaYbF_4$: Ho microtube.

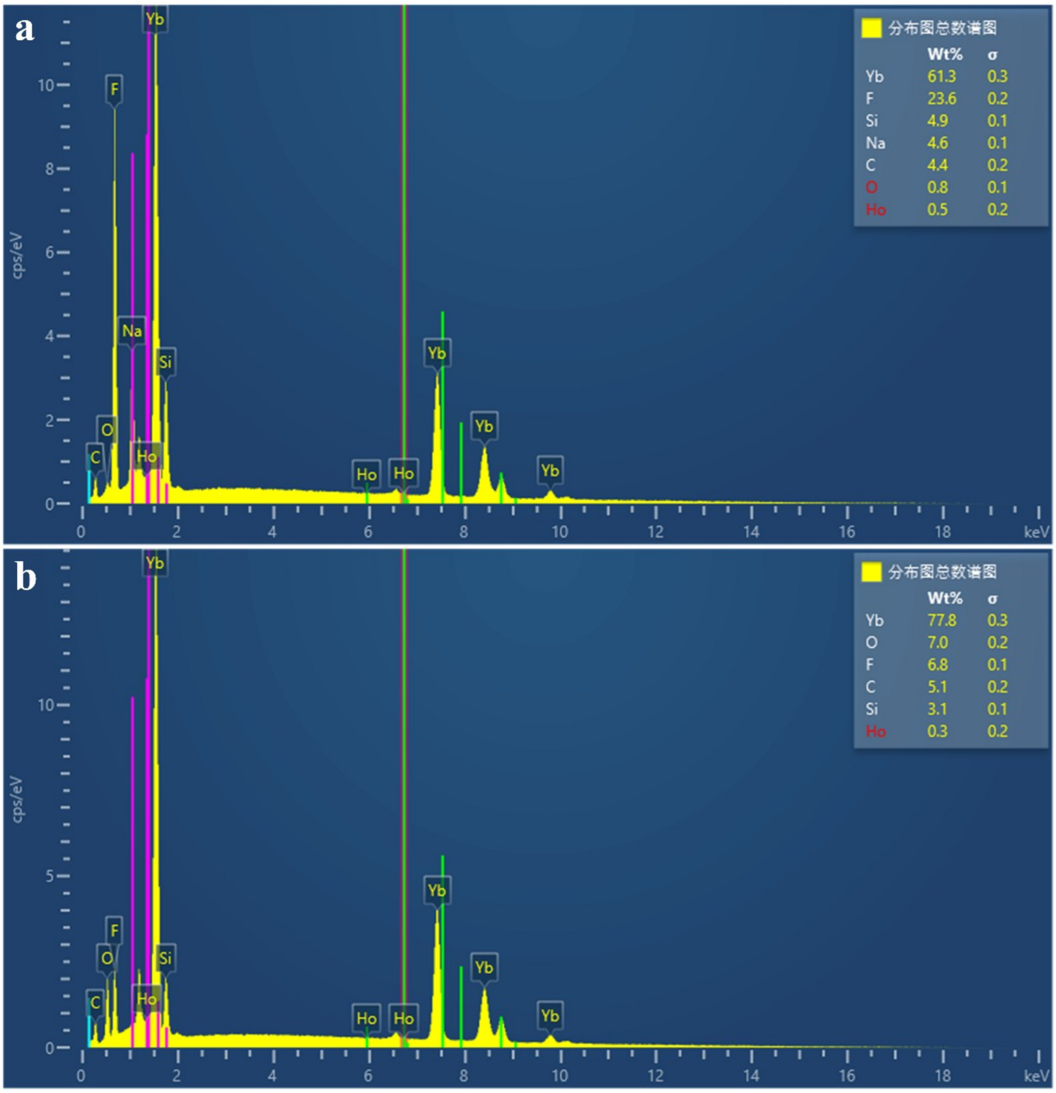

Figure S3 EDX spectra of $NaYbF_4$:Ho microtube before and after laser irradiation by a femtosecond laser with a power density of 15 mJ/cm^2 per pulse. Therein, (a) primitive $NaYbF_4$:Ho microtube, (b) $NaYbF_4$:Ho microtube after laser irradiation.

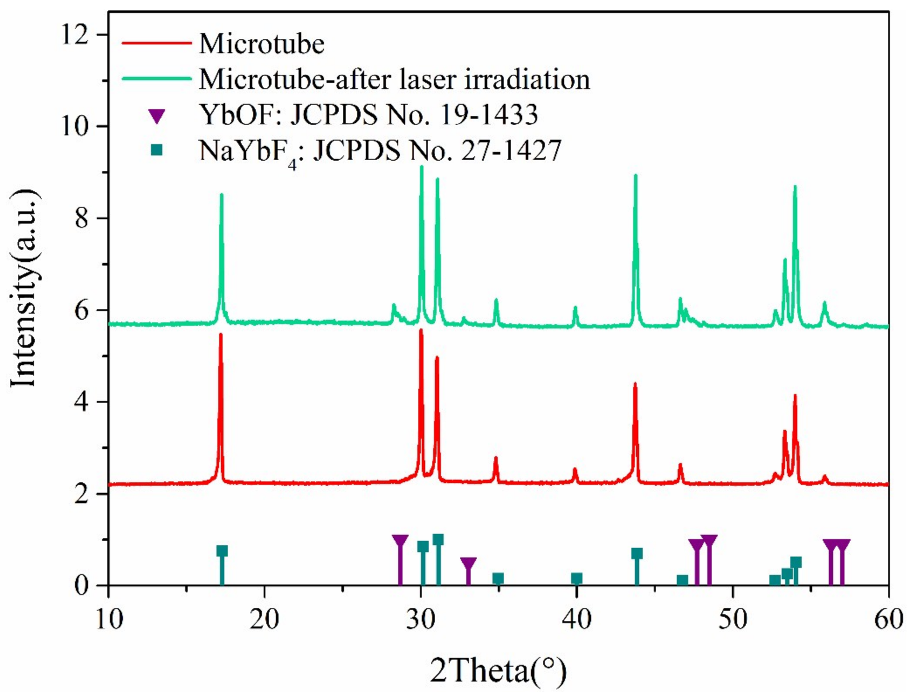

Fig. S4 XRD pattern of $NaYbF_4$:2% Ho^{3+} microtube before and after irradiation by laser with a power density of 15 mJ/cm^2 per pulse. The bottom panels are standard data for hexagonal $NaYF_4$ (JCPDS file number 27-1427) and hexagonal YbOF (JCPDS file number 19-1433).

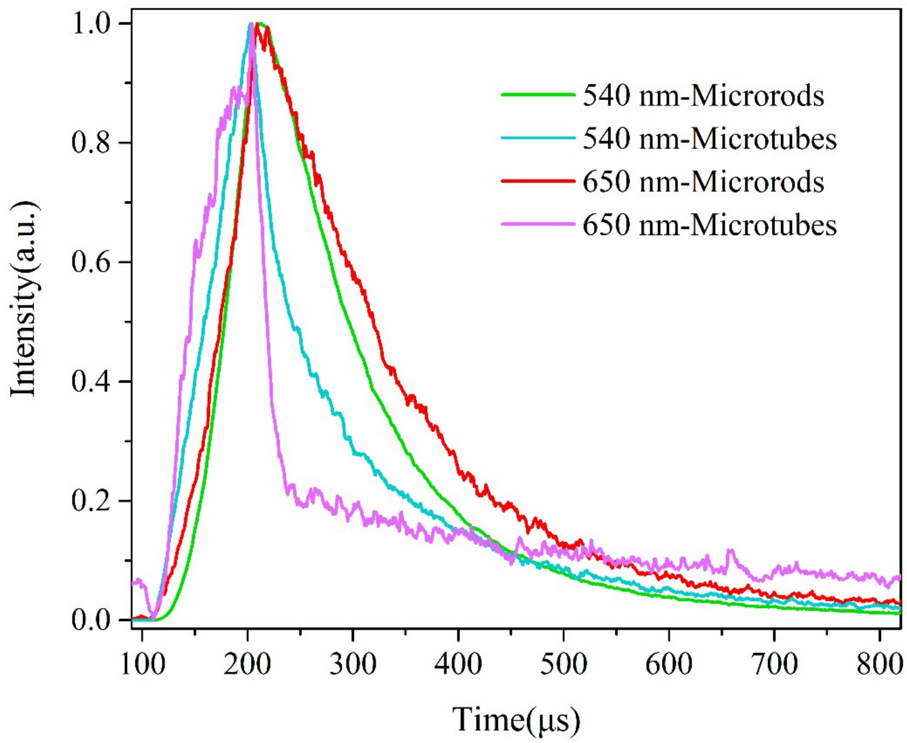

Fig. S5 The normalized luminescence decay curves for $NaYbF_4$:Ho microrods and microtubes with the similar size under a 980 nm laser excitation. The corresponding monitoring wavelength is marked in the map. The longer luminescent lifetime of $NaYbF_4$:Ho microrods indicates the higher crystal quality.

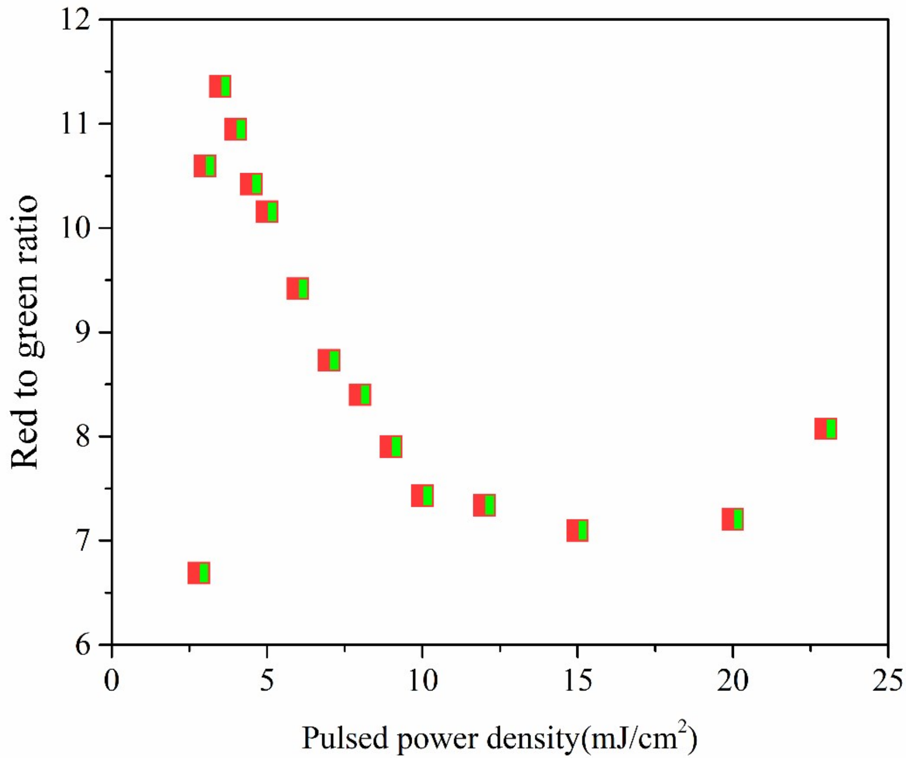

Fig. S6 The red-to-green ratio of upconversion luminescence intensities excited by a femtosecond laser of 980 nm wavelength with different pulsed power densities.