Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.

Supplementary Information

Optimization of fluxes for Yb^{3+}:$YMgB_5O_{10}$ crystal growth and intense multi-wavelength emission characteristics in spectra and laser performances

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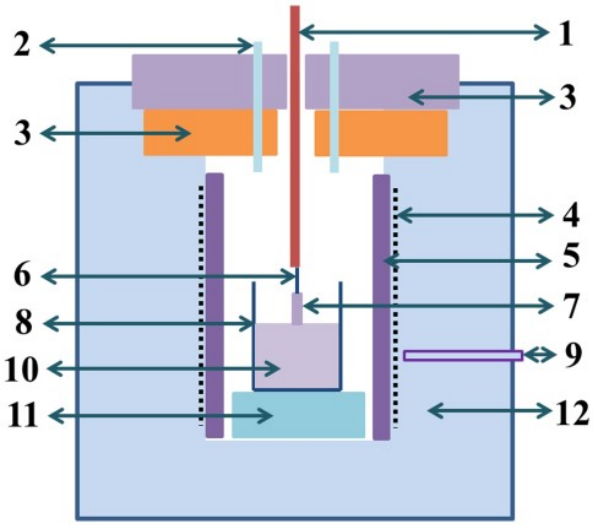

Fig. S1. Schematic diagram of crystal growth apparatus. (1) seed-holder, (2) watch window, (3) furnace cover (thermal insulation materials), (4) nickel-chrome heating wires, (5) Al_2O_3 tube, (6) platinum wires, (7) seed, (8) platinum crucible, (9) thermocouple, (10) solution, (11) thermal insulation materials (the height is based on the thermal field), (12) thermal insulation materials.

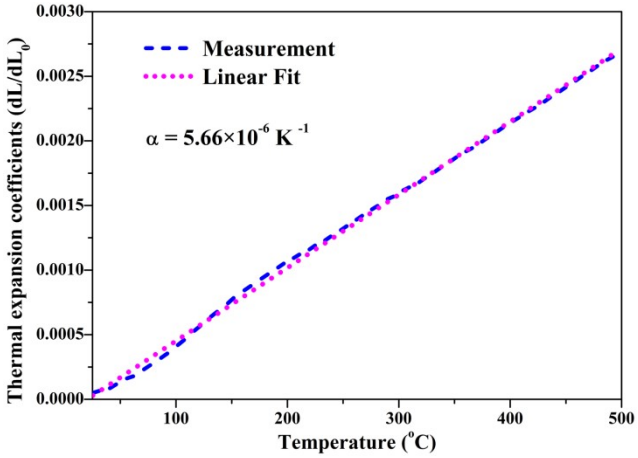

Fig. S2. Thermal expansion coefficients of Yb:YMB crystal.

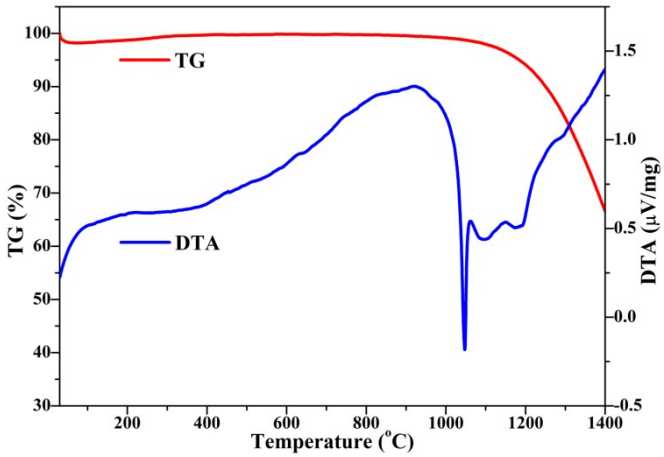

Fig. S3. Differential thermal analysis (DTA) and thermogravimetry (TG) of Yb:YMB crystal.

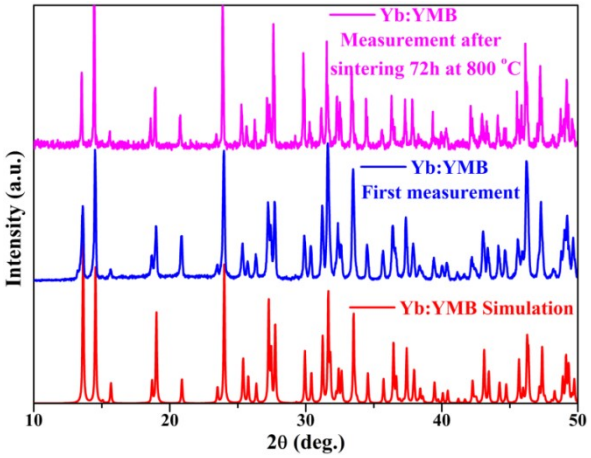

Fig. S4. Powder XRD patterns of Yb:YMB crystal.

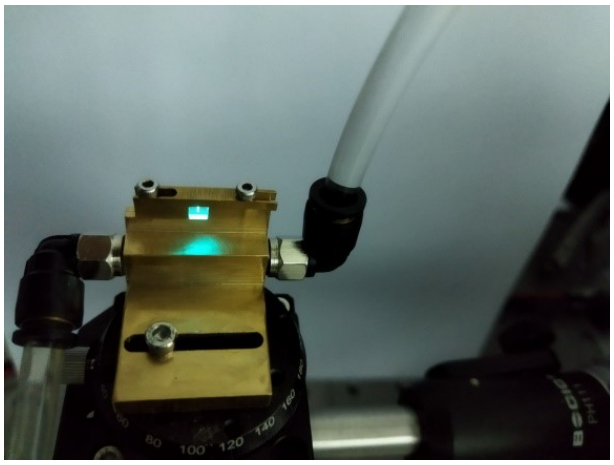

Fig. S5. Cyan light emission phenomenon in the laser experiment.

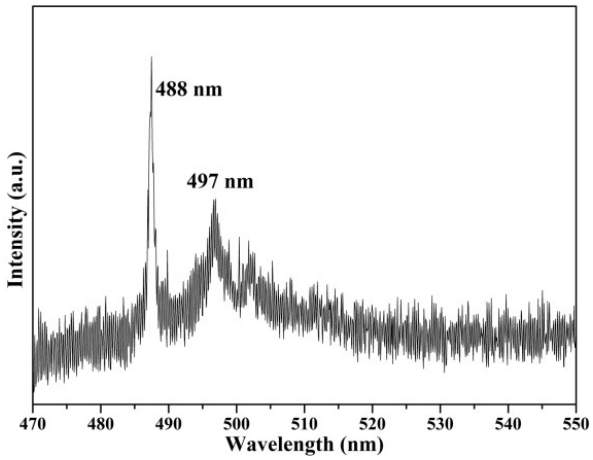

Fig. S6. Laser spectra corresponding to the cyan light emission.

Table S1 Atomic coordinates and equivalent isotropic displacement parameters of Yb:YMB crystal

Atom	*x*/a	*y*/b	*z*/c	*U*(eq)[Å^2]*
Y(1)	1855(1)	1866(1)	7395(1)	4(1)
Yb(1)	1855(1)	1866(1)	7395(1)	4(1)
Mg(1)	6002(1)	4080(2)	6280(1)	6(1)
B(1)	-653(4)	3113(5)	9105(4)	5(1)
B(2)	5842(4)	751(5)	7430(4)	5(1)
B(3)	-2234(4)	326(5)	5548(4)	5(1)
B(4)	3398(4)	-1003(5)	9939(4)	6(1)
B(5)	-177(4)	1740(5)	3955(4)	3(1)
O(1)	1767(2)	-1075(3)	5822(2)	5(1)
O(2)	456(2)	2710(3)	5210(2)	5(1)
O(3)	-94(2)	4091(3)	8024(2)	6(1)
O(4)	58(2)	1504(3)	9262(2)	5(1)
O(5)	6860(2)	327(3)	8741(2)	5(1)
O(6)	2569(2)	-517(3)	8735(2)	6(1)
O(7)	6816(2)	1509(3)	6353(2)	5(1)
O(8)	-841(2)	-281(3)	6484(2)	5(1)
O(9)	3184(2)	1263(3)	4910(2)	5(1)
O(10)	4636(2)	2082(3)	7700(2)	4(1)

* *U*(eq) is defined as one-third of the trace of the orthogonalized U_{ij} tensor.

Table S2 Selected bond distances (Å) of Yb:YMB crystal

Y(1)/Yb(1)-O(6)	2.255(2)	B(1)-O(9)#4	1.365(4)
Y(1)/Yb(1)-O(6)#1	2.311(2)	B(2)-O(3)#5	1.458(4)
Y(1)/Yb(1)-O(10)	2.373(2)	B(2)-O(7)	1.462(4)
Y(1)/Yb(1)-O(2)	2.384(2)	B(2)-O(10)	1.471(4)
Y(1)/Yb(1)-O(4)	2.409(2)	B(2)-O(5)	1.490(4)
Y(1)/Yb(1)-O(3)	2.461(2)	B(3)-O(7)#6	1.449(4)
Y(1)/Yb(1)-O(1)#1	2.516(2)	B(3)-O(1)#7	1.478(4)
Y(1)/Yb(1)-O(1)	2.664(2)	B(3)-O(9)# 7	1.496(4)
Y(1)/Yb(1)-O(9)	2.687(2)	B(3)-O(8)	1.500(4)
Mg(1)-O(4)#2	2.050(2)	B(4)-O(6)	1.341(4)
Mg(1)-O(5)#3	2.051(2)	B(4)-O(5)#8	1.366(4)
Mg(1)-O(7)	2.063(3)	B(4)-O(2)# 5	1.391(4)
Mg(1)-O(4)#1	2.091(2)	B(5)-O(2)	1.457(4)
Mg(1)-O(8)#1	2.158(2)	B(5)-O(1)#7	1.471(4)
Mg(1)-O(10)	2.365(2)	B(5)-O(10)#9	1.473(4)
B(1)-O(3)	1.362(4)	B(5)-O(8)#7	1.478(4)
B(1)-O(4)	1.363(4)		

Symmetry codes: (#1) -x+1/2,y+1/2,-z+3/2; (#2) x+1/2,-y+1/2,-z-1/2; (#3) –x+3/2,y+1/2,-z+3/2; (#4) x-1/2,-y+1/2,z+1/2; (#5) -x+1/2,y-1/2,-z+3/2; (#6) x-1,y,z; (#7) -x,-y,-z+1; (#8) -x+1,-y,-z+2; (#9) x-1/2,-y+1/2,z-1/2