

Supporting Information for:

Composition-engineered Yb³⁺ and Er³⁺ co-doped bimolybdate and bitungstate mixed crystals for promising solid-state infrared lasers

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1. Figure S1

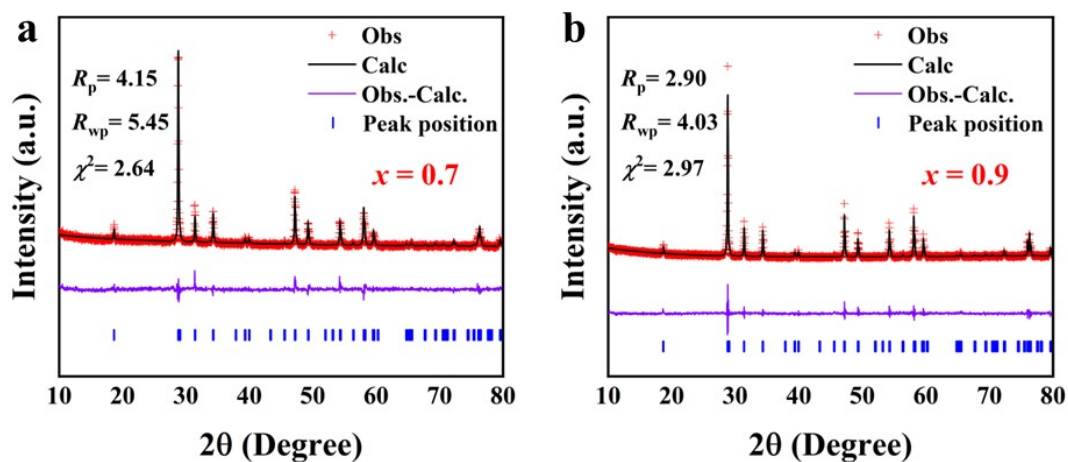


Figure S1 Rietveld refinement XRD patterns for the Yb,Er:NaGd(Mo_xW_{1-x}O₄)₂ ($x = 0.7, 0.9$) crystals.

2. Table S1

Table S1 The hardness data of 10 at% Yb³⁺, 5 at% Er³⁺:NGMW.

Load size	0.1 Kgf			Holding time			10 s		
crystal	Yb,Er:NaGd(Mo _{0.5} W _{0.5} O ₄) ₂			Yb,Er:NaGd(Mo _{0.7} W _{0.3} O ₄) ₂			Yb,Er:NaGd(Mo _{0.9} W _{0.1} O ₄) ₂		
Repeat times	d_1 (μm)	d_2 (μm)	H_v	d_1 (μm)	d_2 (μm)	H_v	d_1 (μm)	d_2 (μm)	H_v
1	21.3	21.3	408.7	21.2	22.2	394.4	22	22.1	381.1
2	20.9	22.1	401.7	21.5	23.2	371.2	22.1	22	382.3
3	21.7	22.0	389.8	21.3	22.8	382.3	22.3	22.5	369.6
4	21.2	21.8	400.8	21.0	23.1	381.1	22.0	23.6	358.3
5	21.5	22	392.9	20.9	20.9	380.7	22.3	22.5	371.2
Average H_v (kg/mm ²)	—	—	398.8	—	—	381.9	—	—	372.5
H_m	—	—	4.97	—	—	4.90	—	—	4.86

3. Figure S2

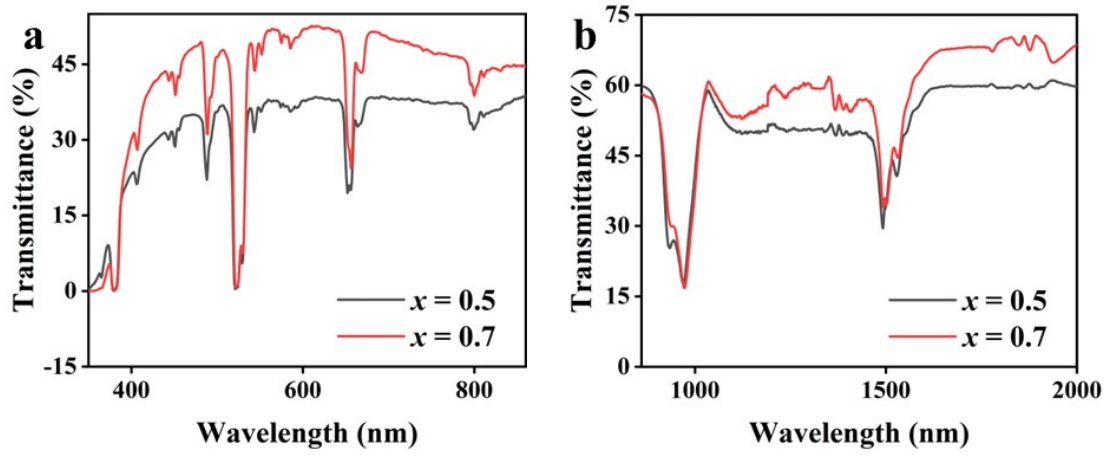


Figure S2 Room temperature transmission spectrum of $\text{Yb,Er:NaGd}(\text{Mo}_x\text{W}_{1-x}\text{O}_4)_2$ ($x = 0.5, 0.7$) crystals.

4. Figure S3

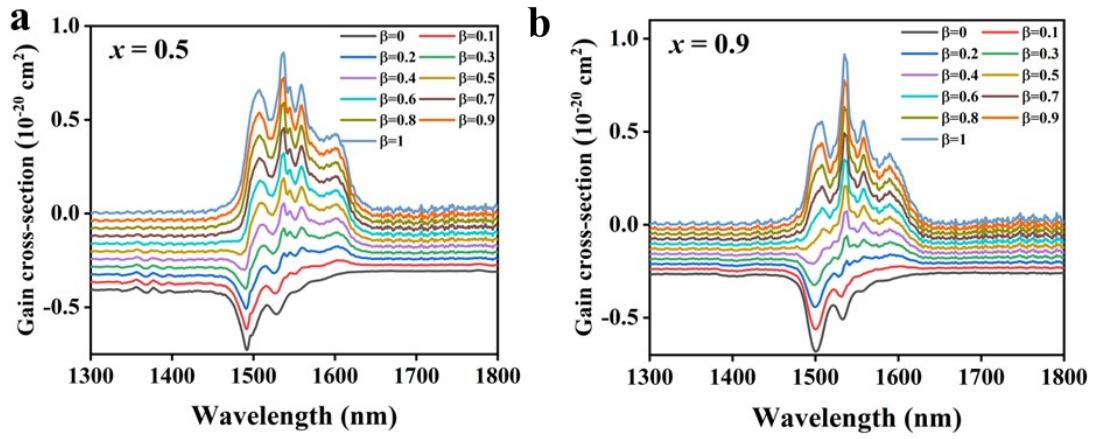


Figure S3 The gain cross-section spectra of $\text{Yb,Er:NaGd}(\text{Mo}_x\text{W}_{1-x}\text{O}_4)_2$ ($x = 0.5, 0.9$) crystal with different inversion parameters β (β from 0 to 1).