

Supporting information

Reporting a novel visible near-infrared $\{\text{Tb}_3\}[\text{Ga}_{0.1}\text{Sc}_{1.9}](\text{Al}_3)\text{O}_{12}$ single crystal for Faraday isolators

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Figure S1. (a) As-grown TSAG crystal; (b) Cracking happened during the processing.

Table S1. Atomic coordinates and equivalent isotropic displacement parameters (\AA^2) for TGSAG.

Table S2. Atomic displacement parameters (\AA^2) for TGSAG.

Table S3. Geometric parameters (\AA , $^\circ$) in TGSAG.

Table S4. XRF detailed data of five selected regions in TGSAG crystal.

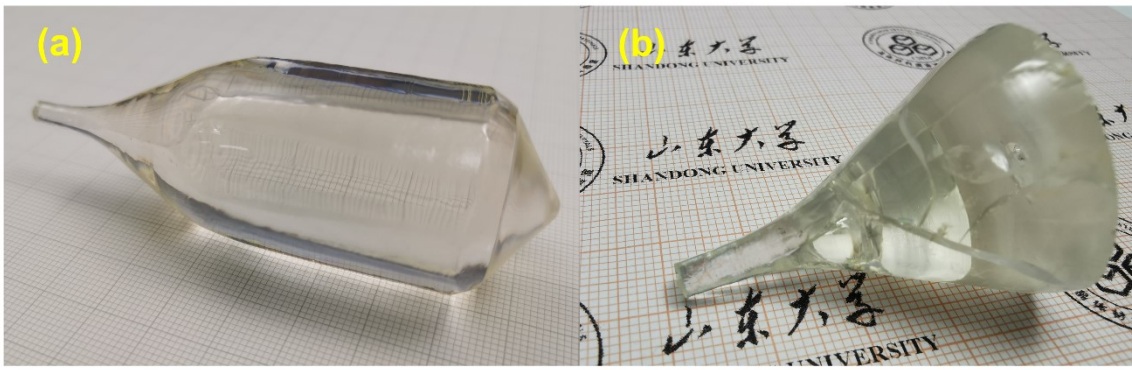


Figure S1. (a) As-grown TSAG crystal; (b)Cracking happened during the processing.

Table S1. Atomic coordinates and equivalent isotropic displacement parameters (\AA^2) for TGSAG.

	<i>x</i>	<i>y</i>	<i>z</i>	U_{iso}^*/U_{eq}	Occ. (<1)
Tb1	1.125	0.5	0.75	0.00657 (19)	
Sc1	1.0	0.5	0.5	0.0082 (4)	0.95
Al1	0.875	0.5	0.75	0.0026 (5)	
Ga1	1.0	0.5	0.5	0.0082 (4)	0.05
O1	0.9684 (2)	0.4447 (2)	0.6555 (2)	0.0074 (5)	

Table S2. Atomic displacement parameters (\AA^2) for TGSAG.

	U^{11}	U^{22}	U^{33}	U^{12}	U^{13}	U^{23}
Tb1	0.0049 (2)	0.0074 (2)	0.0074 (2)	0	0	-0.00131 (11)
Sc1	0.0082 (4)	0.0082 (4)	0.0082 (4)	0.0002 (3)	-0.0002 (3)	0.0002 (3)
Al1	0.0011 (9)	0.0033 (7)	0.0033 (7)	0	0	0
Ga1	0.0082 (4)	0.0082 (4)	0.0082 (4)	0.0002 (3)	-0.0002 (3)	0.0002 (3)
O1	0.0063 (12)	0.0072 (12)	0.0087 (12)	0.0006 (10)	0.0007 (10)	0.0000 (10)

Table S3. Geometric parameters (\AA , $^\circ$) in TGSAG.

Tb1—O1 ⁱ	2.359 (3)	Tb1—Sc1	3.4509 (1)
Tb1—O1 ⁱⁱ	2.359 (3)	Sc1—O1 ^x	2.074 (3)
Tb1—O1 ⁱⁱⁱ	2.359 (3)	Sc1—O1 ^{vi}	2.074 (3)
Tb1—O1	2.359 (3)	Sc1—O1 ^{xi}	2.074 (3)
Tb1—O1 ^{iv}	2.465 (3)	Sc1—O1 ^{xii}	2.074 (3)
Tb1—O1 ^v	2.465 (3)	Sc1—O1 ^{xiii}	2.074 (3)
Tb1—O1 ^{vi}	2.465 (3)	Sc1—O1	2.074 (3)
Tb1—O1 ^{vii}	2.465 (3)	Al1—O1 ⁱⁱⁱ	1.776 (3)
Tb1—Al1	3.0866 (1)	Al1—O1	1.776 (3)
Tb1—Al1 ^{viii}	3.0866 (1)	Al1—O1 ^{xiv}	1.776 (3)
Tb1—Sc1 ^{ix}	3.4509 (1)	Al1—O1 ^{xv}	1.776 (3)

O1 ⁱ —Tb1—O1 ⁱⁱ	69.90 (14)	O1 ^{vi} —Sc1—O1	86.09 (11)
O1 ⁱ —Tb1—O1 ⁱⁱⁱ	112.69 (14)	O1 ^{xi} —Sc1—O1	93.91 (11)
O1 ⁱⁱ —Tb1—O1 ⁱⁱⁱ	163.30 (14)	O1 ^{xii} —Sc1—O1	86.09 (11)
O1 ⁱ —Tb1—O1	163.30 (14)	O1 ^{xiii} —Sc1—O1	180.00 (15)
O1 ⁱⁱ —Tb1—O1	112.69 (14)	O1 ^x —Sc1—Tb1 ^{xiii}	44.92 (8)
O1 ⁱⁱⁱ —Tb1—O1	69.90 (14)	O1 ^{vi} —Sc1—Tb1 ^{xiii}	135.08 (8)
O1 ⁱ —Tb1—O1 ^{iv}	124.18 (6)	O1 ^{xi} —Sc1—Tb1 ^{xiii}	91.22 (7)
O1 ⁱⁱ —Tb1—O1 ^{iv}	71.86 (14)	O1 ^{xii} —Sc1—Tb1 ^{xiii}	88.78 (7)
O1 ⁱⁱⁱ —Tb1—O1 ^{iv}	94.51 (8)	O1 ^{xiii} —Sc1—Tb1 ^{xiii}	41.97 (8)
O1—Tb1—O1 ^{iv}	70.80 (11)	O1—Sc1—Tb1 ^{xiii}	138.03 (8)
O1 ⁱ —Tb1—O1 ^v	70.80 (11)	O1 ^x —Sc1—Tb1	135.08 (8)
O1 ⁱⁱ —Tb1—O1 ^v	94.51 (8)	O1 ^{vi} —Sc1—Tb1	44.92 (8)
O1 ⁱⁱⁱ —Tb1—O1 ^v	71.86 (14)	O1 ^{xi} —Sc1—Tb1	88.78 (7)
O1—Tb1—O1 ^v	124.18 (6)	O1 ^{xii} —Sc1—Tb1	91.22 (7)
O1 ^{iv} —Tb1—O1 ^v	73.39 (13)	O1 ^{xiii} —Sc1—Tb1	138.03 (8)
O1 ⁱ —Tb1—O1 ^{vi}	94.51 (8)	O1—Sc1—Tb1	41.97 (8)
O1 ⁱⁱ —Tb1—O1 ^{vi}	70.80 (11)	Tb1 ^{xiii} —Sc1—Tb1	180.0
O1 ⁱⁱⁱ —Tb1—O1 ^{vi}	124.18 (6)	O1 ^x —Sc1—Tb1 ^{vi}	138.03 (8)
O1—Tb1—O1 ^{vi}	71.86 (14)	O1 ^{vi} —Sc1—Tb1 ^{vi}	41.97 (8)
O1 ^{iv} —Tb1—O1 ^{vi}	109.42 (13)	O1 ^{xi} —Sc1—Tb1 ^{vi}	135.08 (8)
O1 ^v —Tb1—O1 ^{vi}	162.43 (13)	O1 ^{xii} —Sc1—Tb1 ^{vi}	44.92 (8)
O1 ⁱ —Tb1—O1 ^{vii}	71.86 (14)	O1 ^{xiii} —Sc1—Tb1 ^{vi}	88.78 (7)
O1 ⁱⁱ —Tb1—O1 ^{vii}	124.18 (6)	O1—Sc1—Tb1 ^{vi}	91.22 (7)
O1 ⁱⁱⁱ —Tb1—O1 ^{vii}	70.80 (11)	Tb1 ^{xiii} —Sc1—Tb1 ^{vi}	113.6
O1—Tb1—O1 ^{vii}	94.51 (8)	Tb1—Sc1—Tb1 ^{vi}	66.4
O1 ^{iv} —Tb1—O1 ^{vii}	162.43 (13)	O1 ^x —Sc1—Tb1 ^x	41.97 (8)
O1 ^v —Tb1—O1 ^{vii}	109.42 (13)	O1 ^{vi} —Sc1—Tb1 ^x	138.03 (8)
O1 ^{vi} —Tb1—O1 ^{vii}	73.39 (13)	O1 ^{xi} —Sc1—Tb1 ^x	44.92 (8)
O1 ⁱ —Tb1—Al1	145.05 (7)	O1 ^{xii} —Sc1—Tb1 ^x	135.08 (8)
O1 ⁱⁱ —Tb1—Al1	145.05 (7)	O1 ^{xiii} —Sc1—Tb1 ^x	91.22 (7)
O1 ⁱⁱⁱ —Tb1—Al1	34.95 (7)	O1—Sc1—Tb1 ^x	88.78 (7)
O1—Tb1—Al1	34.95 (7)	Tb1 ^{xiii} —Sc1—Tb1 ^x	66.4
O1 ^{iv} —Tb1—Al1	81.22 (7)	Tb1—Sc1—Tb1 ^x	113.6
O1 ^v —Tb1—Al1	98.78 (7)	Tb1 ^{vi} —Sc1—Tb1 ^x	180.0
O1 ^{vi} —Tb1—Al1	98.78 (7)	O1 ^x —Sc1—Tb1 ^{xvi}	91.22 (7)
O1 ^{vii} —Tb1—Al1	81.22 (7)	O1 ^{vi} —Sc1—Tb1 ^{xvi}	88.78 (7)
O1 ⁱ —Tb1—Al1 ^{viii}	34.95 (7)	O1 ^{xi} —Sc1—Tb1 ^{xvi}	41.97 (8)
O1 ⁱⁱ —Tb1—Al1 ^{viii}	34.95 (7)	O1 ^{xii} —Sc1—Tb1 ^{xvi}	138.03 (8)
O1 ⁱⁱⁱ —Tb1—Al1 ^{viii}	145.05 (7)	O1 ^{xiii} —Sc1—Tb1 ^{xvi}	44.92 (8)
O1—Tb1—Al1 ^{viii}	145.05 (7)	O1—Sc1—Tb1 ^{xvi}	135.08 (8)
O1 ^{iv} —Tb1—Al1 ^{viii}	98.78 (7)	Tb1 ^{xiii} —Sc1—Tb1 ^{xvi}	66.4220 (10)
O1 ^v —Tb1—Al1 ^{viii}	81.22 (7)	Tb1—Sc1—Tb1 ^{xvi}	113.6
O1 ^{vi} —Tb1—Al1 ^{viii}	81.22 (7)	Tb1 ^{vi} —Sc1—Tb1 ^{xvi}	113.6
O1 ^{vii} —Tb1—Al1 ^{viii}	98.78 (7)	Tb1 ^x —Sc1—Tb1 ^{xvi}	66.4

All—Tb1—All ^{viii}	180.0	O1 ^x —Sc1—Tb1 ^{xvii}	88.78 (7)
O1 ⁱ —Tb1—Sc1 ^{ix}	36.01 (7)	O1 ^{vi} —Sc1—Tb1 ^{xvii}	91.22 (7)
O1 ⁱⁱ —Tb1—Sc1 ^{ix}	94.35 (7)	O1 ^{xi} —Sc1—Tb1 ^{xvii}	138.03 (8)
O1 ⁱⁱⁱ —Tb1—Sc1 ^{ix}	96.19 (7)	O1 ^{xii} —Sc1—Tb1 ^{xvii}	41.97 (8)
O1—Tb1—Sc1 ^{ix}	128.70 (7)	O1 ^{xiii} —Sc1—Tb1 ^{xvii}	135.08 (8)
O1 ^{iv} —Tb1—Sc1 ^{ix}	160.19 (7)	O1—Sc1—Tb1 ^{xvii}	44.92 (8)
O1 ^v —Tb1—Sc1 ^{ix}	94.21 (6)	Tb1 ^{xiii} —Sc1—Tb1 ^{xvii}	113.6
O1 ^{vi} —Tb1—Sc1 ^{ix}	77.87 (7)	Tb1—Sc1—Tb1 ^{xvii}	66.4
O1 ^{vii} —Tb1—Sc1 ^{ix}	36.47 (7)	Tb1 ^{vi} —Sc1—Tb1 ^{xvii}	66.4
All—Tb1—Sc1 ^{ix}	116.6	Tb1 ^x —Sc1—Tb1 ^{xvii}	113.6
All ^{viii} —Tb1—Sc1 ^{ix}	63.4	Tb1 ^{xvi} —Sc1—Tb1 ^{xvii}	180.0
O1 ⁱ —Tb1—Sc1	128.70 (7)	O1 ⁱⁱⁱ —All—O1	99.09 (18)
O1 ⁱⁱ —Tb1—Sc1	96.19 (7)	O1 ⁱⁱⁱ —All—O1 ^{xiv}	114.90 (10)
O1 ⁱⁱⁱ —Tb1—Sc1	94.35 (7)	O1—All—O1 ^{xiv}	114.90 (10)
O1—Tb1—Sc1	36.01 (7)	O1 ⁱⁱⁱ —All—O1 ^{xv}	114.90 (10)
O1 ^{iv} —Tb1—Sc1	94.21 (6)	O1—All—O1 ^{xv}	114.90 (10)
O1 ^v —Tb1—Sc1	160.19 (7)	O1 ^{xiv} —All—O1 ^{xv}	99.09 (18)
O1 ^{vi} —Tb1—Sc1	36.47 (7)	O1 ⁱⁱⁱ —All—Tb1 ^{xviii}	130.46 (9)
O1 ^{vii} —Tb1—Sc1	77.87 (7)	O1—All—Tb1 ^{xviii}	130.45 (9)
All—Tb1—Sc1	63.4	O1 ^{xiv} —All—Tb1 ^{xviii}	49.54 (9)
All ^{viii} —Tb1—Sc1	116.6	O1 ^{xv} —All—Tb1 ^{xviii}	49.54 (9)
Sc1 ^{ix} —Tb1—Sc1	101.5	O1 ⁱⁱⁱ —All—Tb1	49.54 (9)
O1 ^x —Sc1—O1 ^{vi}	180.0	O1—All—Tb1	49.55 (9)
O1 ^x —Sc1—O1 ^{xi}	86.09 (11)	O1 ^{xiv} —All—Tb1	130.45 (9)
O1 ^{vi} —Sc1—O1 ^{xi}	93.91 (11)	O1 ^{xv} —All—Tb1	130.45 (9)
O1 ^x —Sc1—O1 ^{xii}	93.91 (11)	Tb1 ^{xviii} —All—Tb1	180.0
O1 ^{vi} —Sc1—O1 ^{xii}	86.09 (11)	All—O1—Sc1	127.13 (15)
O1 ^{xi} —Sc1—O1 ^{xii}	180.0	All—O1—Tb1	95.50 (12)
O1 ^x —Sc1—O1 ^{xiii}	86.09 (11)	Sc1—O1—Tb1	102.02 (12)
O1 ^{vi} —Sc1—O1 ^{xiii}	93.91 (11)	All—O1—Tb1 ^{xvii}	125.30 (14)
O1 ^{xi} —Sc1—O1 ^{xiii}	86.09 (11)	Sc1—O1—Tb1 ^{xvii}	98.61 (11)
O1 ^{xii} —Sc1—O1 ^{xiii}	93.91 (11)	Tb1—O1—Tb1 ^{xvii}	103.16 (10)
O1 ^x —Sc1—O1	93.91 (11)		

Symmetry codes: (i) $-x+9/4, -z+5/4, -y+5/4$; (ii) $-x+9/4, z-1/4, y+1/4$; (iii) $x, -y+1, -z+3/2$; (iv) $-z+7/4, -y+3/4, -x+7/4$; (v) $z+1/2, x-1/2, y+1/2$; (vi)

$z+1/2, -x+3/2, -y+1$; (vii) $-z+7/4, y+1/4, x-1/4$; (viii) $x+1/2, y, -z+3/2$; (ix) $y+3/4, -x+7/4, z+1/4$; (x) $-z+3/2, x-1/2, y$; (xi) $y+1/2, z, -x+3/2$; (xii)

$-y+3/2, -z+1, x-1/2$; (xiii) $-x+2, -y+1, -z+1$; (xiv) $-x+7/4, z-1/4, -y+5/4$; (xv) $-x+7/4, -z+5/4, y+1/4$; (xvi) $-y+3/2, -z+3/2, -x+3/2$; (xvii) $y+1/2, z-1/2, x-1/2$;

(xviii) $x-1/2, y, -z+3/2$.

Table S4. XRF detailed data (mass%) of five selected regions in TGSAG crystal.

Positions	Elements	Tb	Ga	Sc	Al
1		74.10	1.33	11.20	13.40
2		74.90	1.30	11.40	12.50
3		74.40	1.30	11.30	13.10
4		74.90	1.27	11.30	12.50
5		74.80	1.27	11.40	12.50