

Table S2: Full details of analytical set-up for EPMA analysis; elements analyzed, peak/background positions, count times, standards, elemental overlap corrections used in REE mineral package.

Element and Line	Diffracting Crystal (Sp#)	Background type/fit	kV/nA	Peak Count Time	Bkgd Count Times		# bkgd points acquired	Standards ¹				Overlapping element and order with their overlap correction standard											
					Lo	Hi		Primary standards	Secondary standards 1	Secondary standards 2	Interference standards	Interfering line	Int std	Interfering line	Int std	Interfering line	Int std	Interfering line	Int std	Interfering line	Int std		
Cu Ka	LLIF (3)	Shared	15/20	20	10 10	1/3	556					Tm I	815	Tb I	814	Er I	805						
Ho Lb	LLIF (3)	Shared	15/100	40	10 10	4/8	1109	808				Y II	816	Yb I	817	Sm I	635	Eu I	806	Th II	629		
Yb La	LLIF (3)	Shared	15/100	40	10 10	4/12	1112	817				Y II	816	Ho I	808	Dy I	804	Tb I	814				
Tm La	LLIF (3)	Shared	15/100	40	10 10	7/12	1111	815				Dy I	804	Sm I	635								
Er La	LLIF (3)	Shared	15/100	40	10 10	5/8	1110	805				Tb I	814										
Gd Lb	LLIF (3)	Shared	15/100	40	10 10	7/8	634	1106				U II	631	Ho I	808								
Dy La	LLIF (3)	Shared	15/100	40	10 10	8/6	1108	804				Th II	629	Eu I	806	Pb II	627	Yb I	817				
Fe Ka	LLIF (3)	Shared	15/20	20	10 10	8/6	502					Th II	629										
Tb La	LLIF (3)	Shared	15/100	40	10 10	8/6	1107	814				Pb II	627	Pr I	637	Sm I	635						
Sm Lb	LLIF (3)	Shared	15/100	40	10 10	12/9	635	1104				Tb I	814	Nd I	636								
Mn Ka	LLIF (3)	Shared	15/20	20	10 10	12/6	557					As II	562										
Eu La	LLIF (3)	Shared	15/100	40	10 10	3/6	1105	806				Pr I	637	Nd I	636								
Nd Lb	LLIF (3)	Shared	15/100	40	10 10	4/3	636	1103				U II	631										
Pr Lb	LLIF (3)	Shared	15/100	40	10 10	4/1	637	1102				U III	631										
Ce La	PET (1)	Linear	15/100	20	40 40	1/1	633	1101				Y III	816	Yb II	817	Tm II	815						
La La	PET (1)	Linear	15/100	20	40 40	1/1	632	1100				Nd I	636	Tm II	815								
Ti Ka	PET (1)	Multipoint	15/20	30	20 20	2/2	559					U III	631										
Ba La	PET (1)	Multipoint	15/100	20	20 20	1/2	554			816		Ti I	559	U III	631	Pr I	637						
Te La	PET (1)	Multipoint	15/100	20	20 20	2/2	560					Sm II	635	U I	631								
Ca Ka	PET (1)	Multipoint	15/20	20	20 20	2/2	535					Y IV	816	Yb II	817	Th III	629	Dy II	804	Tb II	814		
U Mb	LPET (1)	Multipoint	15/100	60	20 20	2/2	631					K I	541	Th I	629	Ho II	808	Gd II	634				
K Ka	LPET (1)	Multipoint	15/20	20	20 20	2/2	541					U I	631										
Th Ma	LPET (5)	Linear	15/100	60	40 40	1/1	629					Gd II	634	Y V	816								
Cl Ka	LPET (5)	Linear	15/20	15	40 40	1/2	545					Ce II	633	Nd II	636	Er III	805	Ho III	808				
Pb Mb	LPET (5)	Multipoint	15/100	100	30 30	3/2	627	520				U I	631	S I	530	Ce II	633	Y VI	638				
S Ka	LPET (5)	Multipoint	15/20	20	20 20	1/2	530					Nd II	636	La II	632								
Nb La	LPET (5)	Multipoint	15/100	20	10 20	1/2	616					Mn III	557										
Zr La	LPET (5)	Multipoint	15/100	30	20 20	2/1	599					Nd III	636	P I	740	Tb IV	814						
P Ka	LPET (5)	Multipoint	15/20	15	20 20	2/2	504					Ca II	558	Cu IV	556	Tm IV	815	Gd III	1106	Ce III	1101		
Y La	LPET (5)	Multipoint	15/100	40	20 20	2/2	628	1115	638			La III	632	Ho IV	808								
F Ka	PCO (2)	Multipoint	15/20	20	40 40	4/4	2001	2002				Sm VIII	635	Ce VII	633	P III	740	Y III	638	La VIII	632	U V	631
Sr La	TAP (4)	Multipoint	15/100	30	20 20	1/3	513					Y I	816	U II	631								
Si Ka	TAP (4)	Multipoint	15/20	40	20 20	1/2	501					Y I	638	Tb IV	814	Nd III	636	Er IV	805				
Al Ka	TAP (4)	Multipoint	15/20	20	20 20	2/2	501					Ti III	559	Yb I	817	Ho I	808						
As La	TAP (4)	Multipoint	15/100	40	20 20	1/2	562					Sm I	635	Nd IV	636								
Mg Ka	TAP (4)	Multipoint	15/20	30	20 20	1/2	502					U II	631										
Na Ka	TAP (4)	Multipoint	15/20	20	20 20	2/2	501					U III	631										
V Ka	LPET (5)	Linear	15/100	40	10 10	1/1	608																
W La	LPET (5)	Linear	15/100	40	10 10	1/1	596	739															
Sc Ka	LPET (5)	Linear	15/100	40	10 10	1/1	619	1116				Ca I	535										
Ta La	LPET (5)	Linear	15/100	40	10 10	1/1	601																
Bi Ma	LPET (5)	Linear	15/100	40	10 10	1/1	568					Ce II	1101										

¹ See Full Standard List (Table S3) for standard number references