

**Table S1** Overview of granite facies in studied plutons with indication of minor and accessory minerals (X- common, x- accessory)

Pluton	Rock facies	Pyrochlore	Microlite	CGM	Cassiterite	Wolframite	Fluorite	Thorite	Zircon	Pyroxene	Cryolite
<b>Madeira</b>	Amf-Bt granite								x		
	Bt granite								x		
	Hypersolvus granite	x		x					x	x	
	Border albite granite	x		X	x			x	x		
	Core albite granite	X		X	x			X	X	X	X
<b>Orlovka</b>	Porphyritic Bt-granite								X		
	Bt-Phengite granite						X		X		
	Ab-Mcr granite			x			x		x		
	Ab-Ms granite			x			X	x	x		
	Ab-Lpd-Amazonite granite		X	x	x	x	X	x			
	Layered aplite-pegmatite bodies		X	x			x	x	x		
	Beryl-Toz exogreisen			x		X	X	x			
<b>Cínovec</b>	Ab-Bt granite	x						x	X		
	Ab-Znw granite	x		x	x				X		
	Ab-Znw microgranite							x	x		
	Mica-free granite								x		
	Feldspatite										
	Ab-Znw granite of the cupola	x	x	x					x		
	Qtz-Znw greisen			X	X	X	x		x		

**Table S2** List of samples

Localit y	Sample	Rock type	Localizatio n	Annite	Li- mica	Musc ovite	Na- Amf	Zirc on	Thor ite	Colum bite	Pyroch lore	Microl ite	Cassit erite	Cryo lite	Fluor ite	Monaz ite	Xenoti me	RE E-F	REE- carb.	Other
Madeira	PHR-191	Hypersolvus granite	Outcrop	x			x	x		x	x				x					Mnz, Ilm
Madeira	PHR-174	Border albite granite	Outcrop					x	x	X	(x)		x					x		
Madeira	PHR-82A (4894)	Core albite granite	Outcrop	x	x		x	x	X	x	X			X				X		
Madeira	PHR-127	Core albite granite	Outcrop	x				x	x	x	X									Gn, Sp
Madeira	PHR-128	Core albite granite	Outcrop	X	X		x	X		x	X		x	x						
Madeira	PHR-171	Core albite granite	Outcrop	x				X	X	x	X		x	X						Xnt
Madeira	PHR-246	Core albite granite	Outcrop	x				X		x	X		x	X						Gn
Madeira	PHR-159	Core albite granite	00/400W	x	x		x	X		x	X			XX						
Madeira	PHR-160	Core albite granite	00/400W	x	x		x	X		x	X			x						
Madeira	PHR-161	Core albite granite	00/400W	x	x		x	X		x	x			x						
Madeira	PHR-163	Core albite granite	00/400W	x				x	X	x	X									
Madeira	PHR-239	Core albite granite	FC8, 49.78m	X	X		(x)	XX	XX		x									Gn
Madeira	PHR-240	Core albite granite	FC8, 271.91m	x			x	X	X		x			X						
Madeira	PHR-242	Core albite granite	250N/950W, 56.60m	X	X		x	X	X	x	X			x						Gn, Sp
Madeira	PHR-243	Core albite granite	250N, 76.92m	x				X		x	X			x						Gn, Sp
Madeira	PHR-244	Core albite granite	250N, 88.38m	X			x	X	x	x	X									
Madeira	PHR-245	Core albite granite	250N, 118.05	X				X	X	x	X		x	x						
Madeira	PHR-247	Core albite granite	250S/500W, 179.75m	X				X		x	X			x						Sp
Orlovka	O-222	Ab-Ms Granite	Borehole 30, 200m			X		x	x	x					X	x	x		x	
Orlovka	O-253	Amazon-Lpd granite	Orlovka open pit		X			x		X		X	x		x	x				Wlf
Orlovka	O-369	Amazon-Lpd granite	Orlovka open pit		X				x	x		x			X	x				
Orlovka	4703	Amazon-Lpd granite	Orlovka open pit		X			x		x			x		x	x				
Orlovka	O-353	Pegmatite/apl ite linerock	Orlovka open pit		X			x	x	x		x			x	x				Py, Sp

Cínovec	5423	Ab-Znw granite, upper part	Borehole CIS-2, 180m		X			x		x		x			x	x			x	Py
Cínovec	4689	Ab-Znw granite, deeper part	Borehole CS-1, 735m		X			x		x	x	x	x		x				x	Gn, Cof
Cínovec	4940	Bt granite	Borehole CS-1, 1025m	X				x	x		x		x		x	x	x		x	

**Table S3** Conditions of electron-probe micro analyses

Atomic no.	Element	Standard	29 Elements	25 Elements	Limit of detection (wt%)
9	F	fluorite	K $\alpha$	K $\alpha$	0.04
11	Na	jadeite	K $\alpha$	K $\alpha$	0.02
12	Mg	olivine	K $\alpha$		0.01
13	Al	corundum	K $\alpha$		0.01
14	Si	quartz	K $\alpha$	K $\alpha$	0.02
19	K	leucite	K $\alpha$		0.02
20	Ca	diopside	K $\alpha$	K $\alpha$	0.03
21	Sc	Sc metal standard	K $\alpha$		0.01
22	Ti	rutile	K $\alpha$	K $\alpha$	0.04
25	Mn	Mn <sub>3</sub> O <sub>4</sub>	K $\alpha$	K $\alpha$	0.03
26	Fe	haematite	K $\alpha$	K $\alpha$	0.03
30	Zn	willemite	K $\alpha$	K $\alpha$	0.06
33	As	GaAs	L $\beta$		0.05
37	Rb	RbCl	L $\alpha$		0.03
38	Sr	celestite	L $\alpha$		0.03
39	Y	cubic zirconia	L $\alpha$	L $\alpha$	0.03
40	Zr	cubic zirconia	L $\alpha$		0.04
41	Nb	Nb metal standard	L $\alpha$	L $\alpha$	0.04

50	Sn	Sn metal standard	L $\alpha$	L $\alpha$	0.04
51	Sb	Sb metal standard	L $\alpha$		0.03
55	Cs	pollucite	L $\alpha$		0.04
56	Ba	barite	L $\alpha$	L $\alpha$	0.03
57	La	REE glass standard		L $\alpha$	0.04
58	Ce	REE glass standard	L $\alpha$	L $\alpha$	0.05
59	Pr	REE glass standard		L $\beta$	0.12
60	Nd	REE glass standard		L $\alpha$	0.07
62	Sm	REE glass standard		L $\alpha$	0.07
66	Dy	REE glass standard		L $\beta$	0.15
68	Er	REE glass standard		L $\alpha$	0.08
70	Yb	REE glass standard		L $\alpha$	0.09
73	Ta	Ta metal standard	M $\alpha$	M $\alpha$	0.04
74	W	W metal standard	M $\alpha$	M $\alpha$	0.03
82	Pb	crocoite	M $\alpha$	M $\alpha$	0.04
83	Bi	Bi metal standard	M $\alpha$		0.06
90	Th	Th metal standard	M $\alpha$	M $\alpha$	0.06
92	U	U metal standard	M $\beta$	M $\beta$	0.04
	Accelerating voltage		15 kV	15 kV	
	Beam current		10 nA	10 nA	
	Beam diameter		spot*, 1 $\mu$ m, 2 $\mu$ m	spot*, 1 $\mu$ m, 2 $\mu$ m	
	Counting time for peak		20 and 30 s	20, 30, 40 s	
	Counting time for $\pm$ background		10 and 15 s	10, 15, 20 s	

\* spot is focused electron beam