Magna et al.

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Supplementary Information

All investigated Archean pegmatites (Tanco, Greenbushes, Bikita) are hosted in metabasites. Although granitic source parentage is plausible, no particular granitic body was assigned to any of these. All these pegmatites are similar in size, shape, internal structure, mineralogy, and the total volume of Li-bearing minerals as well as common products of reactions with host rocks, such as holmquistite (Li-amphibole). Subtle differences in the depths of emplacement and the dominant Li-bearing phase exist: $\sim 2-3$ kbar/petalite (Tanco, Bikita) versus ~ 5 kbar/spodumene (Greenbushes). The Proterozoic Black Hills pegmatite is similar to the Archean pegmatites in all major aspects (i.e., size, shape, internal structure, mineralogy) with spodumene as a dominant Li-phase, likewise in Greenbushes. In contrast to the sampled Archean pegmatites, the Black Hills pegmatite intruded mica schists at $\sim 3-4$ kbar and its parental granite is known. The pegmatites from the Nová Ves (Moldanubian Zone) and Elba are much smaller in size and volume and mostly are enclosed in metabasites and serpentinites. They intruded at shallow crustal levels of $\sim 2-3$ and *ca*. 1.5 kbar, respectively. The parental granite is not known in the former case but is evident in the latter.

General geology of the studied pegmatite localities

The **Tanco pegmatite** (50°25'40"N, 95°27'20"W) is enclosed in metagabbroic to amphibolitic rocks of the Bernic Lake Formation situated in the southern limb of the Bird River Greenstone Belt (~2750–2715 Ma) of the Superior Province, Canadian Shield. The broader area is built of various metavolcanic rocks, polymict metaconglomerates, granodioritic quartz porphyries, and rocks of iron-formation, metamorphosed from greenschist lower amphibolite facies (andalusite + cordierite), and locally to granulite facies. The Lac Du Bonnet Batholith (2665 ± 20 Ma), largely composed of biotite granite, is located \sim 3 km south of the Tanco pegmatite (2640 ± 7 Ma; Baadsgard and Černý, 1993). Also numerous small intrusions of leucocratic peraluminous granites are present in this region and derivation of the Tanco pegmatite by progressive fractionation from leucocratic granites has been suggested (Stilling et al., 2006), although parental granite is not exactly known. The pegmatite is a giant sub-horizontal body, up to ~ 100 m thick and ~ 1.6 km long, which cuts foliated metagabbroic rocks (Stilling et al., 2006). Nine zones of different mineral compositions and textures were distinguished (Stilling et al., 2006): (i) border zone (Ab + Qz), (ii) wall zone (Ab + Qz + Kfs + Ms), (iii) aplitic albite zone (Ab + Qz), (iv) lower intermediate zone (Kfs + Qz + Ab + Spd + Amb), (v) upper intermediate zone (Spd + Qz + Amb), (vi) central intermediate zone (Kfs + Qz + Ab + Ms), (vii) guartz zone, (viii) pollucite zone, (ix) lepidolite zone (Lpd + Li-Ms + Kfs). An exomorphic unit (Bt + Tur + Hmq) is locally developed around the pegmatite. Total volume of Li-bearing minerals (dominated by petalite and spodumene + quartz aggregates after petalite) in the bulk pegmatite is $\sim 14-15$ vol.% corresponding to an average 0.74 wt. % of Li₂O in the whole body (Stilling et al., 2006). All examined minerals from Tanco were studied in detail by Černý and coauthors (see Stilling et al., 2006, and Černý, 2005, for reviews). More details about mineralogy,

geochemistry and geology of the Tanco pegmatite are given elsewhere (Černý, 2005; Černý et al., 1998; Stilling et al., 2006).

The Greenbushes pegmatite $(2527 \pm 7 \text{ Ma}; 33^{\circ}51'25.00"\text{ S}, 116^{\circ}3'47.00"\text{ E})$ intruded metabasites of the Balingup Metamorphic Belt of the Archean Western Gneiss Terrane, Western Australia (Gee et al., 1981). This area is built by dioritic gneisses, amphibolites, associated banded iron-formation, ultramafic schists, and felsic massive to banded paragneisses as a part of Archean greenstone-like sequence. This region underwent several phases of deformation and metamorphism, mostly older than the pegmatite intrusion, up to T \sim 550–600°C (Partington et al., 1995). These lithologies were intruded by dolerites and granitoids some of which predate the Greenbushes pegmatite intrusion. Several types of granitoid rocks were recognized, which are older, synchronous, or younger than the Greenbushes pegmatite. The Logue Brook granitoid (2612 ± 5 Ma) represents an earlier granite deformed by a shear zone. Other granitoid occurrences, such as the Cowan Brook Dam (2588 \pm 93 Ma) and Millstream Dam granitoid body (2577 \pm 4 Ma), also show older ages compared to the Greenbushes pegmatite for which the parental granite is not known (Partington et al., 1995). The complex body of the Greenbushes pegmatite forms a series of linear dikes, up to ~200 m thick and several km long, dipping along the W-trending regional lineament which is near parallel to the Donnybrook–Bridgetown shear zone (Partington et al., 1995). The major dike exhibits complex and asymmetrical internal structure with (i) aplitic border (contact) zone (Ab + Qz + Bt + Tur), (ii) lower and (iii) upper Li-zone (Spd + Qz + Kfs), (iv) K-feldspar zone (Kfs + Qz + Spd), and (v) albite zone (AbQz + Ms + Spd), both situated in the center of the dike. Spodumene apparently is the dominant Li-bearing phase along with minor amblygonite, triphylite, lepidolite and accessory minerals – beryl, pollucite. (vi) A greisen-like unit (Ms + Qz) associated with shear zones is locally developed. The pegmatite body underwent at least two significant phases of deformation and recrystallization at ~2430 Ma and ~1100 Ma. More details about mineralogy and geology of the Greenbushes pegmatite are given in Partington et al. (1995).

The **Bikita pegmatite** (2650 Ma; 19°57'12.00"S, 31°26'15.00"E) is located near Fort Victoria, Zimbabwe, in the Victoria Schist Belt of the Zimbabwean Craton, surrounded by granites of Archean age such as the Mushandike Granite (3520 ± 260 Ma). The belt is built by complex of metabasites, schists and so called "Younger Granites" (2630 ± 15 Ma). The sampled pegmatite forms a large body 40–70 m thick and ~1.7 km long as a part of the complex pegmatite system. It is enclosed in quartz-bearing amphibolite of the Victoria Schist Belt. The pegmatite dike exhibits complex asymmetrical and layered internal structure similar to that of the Tanco pegmatite and its mineralogy is dominated by petalite, secondary spodumene, common Li-micas and pollucite; nevertheless, available mineralogical and geochemical data from the Bikita pegmatite are rather sparse (Cooper, 1964).

The mineralogy and geochemistry of pegmatites from the Harney Peak granite–pegmatite system, **Black Hills**, South Dakota (1709 \pm 12 Ma), were multiply studied. These pegmatites cut a metasedimentary complex of Proterozoic age (2200–1880 Ma) composed of various

mica schists, derived from shales and graywackes, and rare amphibolites. Two late-Archean granites, the Little Elk granite (~2560 Ma) and Bear Mountain granite (~2450 Ma), crop out in this region. Regional metamorphism of the metasedimentary complex and granites was followed by thermal metamorphic overprint from staurolite to high-grade sillimanite facies which was triggered by intrusion of the S-type Harney Peak Granite. Texturally and compositionally highly heterogeneous peraluminous muscovite granite was emplaced at midcrustal levels (~3-4 kbar; e.g., Shearer et al., 1986). Based on the zoned arrangement of pegmatites around the Harney Peak Granite and their geochemical relations, the pegmatites are considered fractionation derivatives of this granite and several distinct mechanism of this process were postulated (Shearer et al., 1992). The examined pegmatite dikes – (i) Tin Mountain (43°44'49"N, 103°43'14"W; spodumene-subtype pegmatite, samples of spodumene and amblygonite), (ii) Helen Beryl (43°42'46"N, 103°41'49"W; spodumene-subtype pegmatite, sample of beryl), and (iii) Bob Ingersol (43°54'38"N, 103°27'8"W; lepidolitesubtype pegmatite, samples of tournaline, lepidolite and muscovite) – form complexly zoned large bodies (~30 m thick) with mutually similar internal structure and mineralogy (Shearer et al., 1992) that cut foliated mica schists. The Tin Mountain pegmatite is the most fractionated and Bob Ingersol records the highest fluorine activity, documented by abundant lepidolite and the absence of spodumene (Shearer et al., 1992). Some pegmatites contain substantial amounts of Li-bearing minerals, mainly spodumene (e.g., Etta Mine). More details about geology, mineralogy and geochemistry of the Harney Peak granite-pegmatite system are given elsewhere (Nabelek and Glascock, 1995; Nabelek et al., 2001; Shearer et al., 1992; Teng et al., 2006).

The Nová Ves pegmatite (48°56'50"N, 14°15'8"E) near Český Krumlov, Czech Republic, is part of the Moldanubian pegmatite field. The Moldanubian Zone is a tectonic collage of crustal and upper mantle lithologies assembled during the Variscan orogeny with several major units defined: (i) mid-crustal amphibolite-facies Drosendorf Unit, (ii) the lower crustal/upper mantle Gföhl Unit, and (iii) fragments of Paleoproterozoic orthogneisses (e.g., Schulmann et al., 2009, and references therein). The Moldanubian pegmatite field is characterized by numerous granitic pegmatites ranging from primitive barren to highly fractionated pegmatites with both the LCT and NYF affinities (Novák et al., 2013). The mineral assemblages of LCT pegmatites (338–325 Ma) suggest an emplacement and crystallization at $P < \sim 2-3$ kbar. Parental granites of pegmatites are unknown although local tourmaline-bearing leucogranitic bodies closely associated with granitic pegmatites have been suggested as a probable source (Novák and Cempírek, 2010). The Nová Ves pegmatite is a typical example of petalite-subtype pegmatites of the Moldanubian Zone dated at 325 ± 2 Ma (Melleton et al., 2012). A symmetrically zoned dyke, up to ~ 10 m thick and ~ 100 m long, cuts serpentinite (former garnet peridotite) enclosed in the Blanský les granulite massif. The dyke consists of (i) a border granitic unit (Kfs + Qz + Pl + Bt), (ii) a graphic unit (Kfs + Qz) evolving to (iii) blocky K-feldspar, (iv) an intermediate albite unit (Ab + Oz + Ms + Sch), (v) a petalite unit with minor lepidolite and rare amblygonite, and (vi) a lepidolite unit with common elbaite, minor to rare amblygonite, and pollucite. The Li-bearing minerals account for $<\sim 0.5$ vol. % of the bulk pegmatite body.

The Elba pegmatite field (approximately 42°44'55"N, 10°12'30"E – La Speranza pegmatite) of late Miocene age (~6.7–6.9 Ma) is located in the Monte Capanne Pluton and adjacent metamorphic envelope of the Tuscan Magmatic Province (Rocchi et al., 2002). The envelope consists of Jurassic oceanic lithosphere (serpentinized ophiolites, gabbro, peridotite) and thermally metamorphosed upper Jurassic-middle Cretaceous sedimentary cover (chert, limestone, argillite). The Monte Capanne Pluton is a texturally diverse mildly peraluminous and often porphyric monzogranite (Dini et al., 2002) with minor biotite and locally mafic microgranular enclaves varying from tonalite to monzogranite (Gagnevin et al., 2004; Rocchi et al., 2002). The Monte Capanne Pluton apparently is the parental granite of these pegmatites and it intruded the upper crust level at ~ 1.5 kbar. Numerous small pegmatite dikes (commonly ~1 m thick) occur in the eastern part of the Monte Capanne Pluton and its adjacent metamorphic envelope (Pezzotta, 2000). Simply zoned pegmatites commonly show asymmetric internal structure with border aplitic unit (Ab + Kfs + Qz + Bt), aplite-pegmatite unit with graphic intergrowths (Kfs + Qz and Ab + Qz), and pegmatite core with open vugs in the center of the dike close to the hanging wall. Most or all Li-bearing minerals (elbaite, petalite, lepidolite) are developed along with typical accessory minerals such as garnet, beryl, apatite, pollucite, cassiterite, and late zeolites. The Li-bearing minerals account for less than ~ 0.5 vol. % of the bulk pegmatite body.

Collectively, decreasing magmatic ages correlate with the decreasing thickness of the pegmatite dikes, from up to 100 m found for all Archean localities to \sim 50 m for Black Hills to \sim 10 m in Nová Ves and \sim 1 m in Elba. Petalite is the major Li-aluminosilicate for Tanco and Bikita reflecting their lower pressures of emplacement compared to Greenbushes but other parameters are near-identical, including host rock lithology, general geology of the respective area as well as the major mineralogy of the deposits (Table DR1).

TABLE DR1: SUMMARY OF GENERAL GEOLOGY OF INDIVIDUAL LOCALITIES								
Pegmatite	Tanco	Greenbushes	Bikita	Black Hills	Nová Ves	Elba		
Location	Manitoba, Canada	Australia	Zimbabwe	South Dakota, USA	Czech Republic	Italy		
Age (Ma)	2640 ± 7	2527 ± 7	2650	1709 ± 12	325 ± 2	6.7-6.9		
Examined dike	main dike	main dike	main dike	Tin Mountain, Bob	single dike	dikes near Piero in		
				Ingersol, Helen		Campo		
				Beryl				
Host rocks	metabasite	metabasite	metabasite	mica schists	serpentinite	metabasite,		
						serpentinite, granite		
Parental pluton	unknown	unknown	unknown	Harney Peak	unknown	Monte Capanne		
				granite		Pluton		
Emplacement level (kbar)	2-3	5	2–3	3–4	2–3	1.5		
Primary Li-	petalite	spodumene	petalite	spodumene	petalite	petalite		
aluminosilicate								
Typical size	up to 100 m	up to 100 m	up to 70 m	up to 50 m	up to 10 m	up to 2 m		
Typical shape	dike	complex dike	complex dike	teardrop, dike	dike	dike		
Typical dip	sub-horizontal	moderate	moderate	sub-vertical	sub-vertical	sub-horizontal		
Volatiles	$P \sim F > B$	$P \sim B > F$	$P \sim F > B$	$P > F \sim B$	$\mathbf{B} > \mathbf{F} > \mathbf{P}$	$\mathbf{B} > \mathbf{F}$		

Crystallographic data

The weighted mean Li– ϕ distance (WtMD; $\phi \equiv O$, OH, F) and effective coordination number (ECoN) represent indirect measures of the bond strength between cations and anions in the examined polyhedra (similar to the average bond length and coordination number in non-deformed polyhedra). Several of the studied minerals feature strongly distorted coordination polyhedra of Li, in particular spodumene, amblygonite, lithiophilite, elbaite, and holmquistite. Their quantitative description using average bond length or coordination number (as measures of the bond strength in the polyhedron) is therefore strongly affected by a subjective choice of anions participating in the polyhedron. For example, coordination number of Li in spodumene can be 4 if the shortest cation–anion distances (<2.1 Å) are used. However, if another one or two more distant oxygen anions (Li–O distances 2.347 and 2.76 Å, respectively) are used, the coordination number increases to 5 or 6, respectively. The weighted mean Li- ϕ distance (WtMD) and effective coordination number (ECoN) values of Nespolo et al. (2001) avoid this problem by calculating the weights of individual bonds; the differences between the ECoN and arbitrarily selected coordination numbers are most pronounced in amblygonite (ECoN = 4.649 instead of 4 or 5), spodumene (ECoN = 5.726instead of 5 or 6), and holmquistite (ECoN = 4.769 instead of 4 or 5). The two values reflect specific geometries of Li polyhedra in individual structures; in order to provide comprehensive information, we present both ECoN and WtMD values and provide their comparison to arbitrary coordination numbers and average bond lengths (Table S4). Calculations of both values are independent of ionic radii of individual elements; however, in some cases they are based on imperfect natural samples with poly-ionic substitutions at both cation and anion sites (e.g., tourmaline, micas). The weighted mean $Li-\phi$ distance values provide better correlation with δ^{7} Li values among different mineral species than ECoN values which tend to cluster relatively close to their nearest integer values (Fig. 1).

The WtMD and ECoN values for individual mineral phases were calculated using iterative formulae of Nespolo et al. (2001). The two values (WtMD, ECoN) use individual bond weights derived iteratively from geometrical analysis of the coordination polyhedron, and therefore provide more accurate information on charge distribution in distorted polyhedra compared to subjectively chosen coordination number and resulting average bond lengths. Following publications were used for crystallographic data for individual minerals:

- 1) muscovite: sample 129 of Brigatti et al. (2001)
 - 2) beryl: pezzottaite sample (the "rigid body motion" corrected values) of Gatta et al. (2012)
- 3) lepidolite: sample SBT (polylithionite-2M₂) of Brigatti et al. (2005). Data for polylithionite were used for all Li-rich micas (lepidolite, Li-muscovite) because they most reliably represent the Li–O bonds in octahedral layers of mica due to the highest Li content and the absence of octahedral vacancies.
- 4) petalite: Effenberger (1980)
- 5) spodumene: sample 298K of Tribaudino et al. (2003)
- 6) elbaite: Bosi et al. (2005)

- 7) tourmaline (elbaite, schorl): sample L4e (elbaite) of Bosi et al. (2005) was used due to its high Li content.
- 8) amblygonite: sample AF-46 of Groat et al. (2003). The data for amblygonite– montebrasite solid solution differ slightly depending on the fluorine content. Values from sample with F/(F+OH) = 0.55 are used.
- 9) holmquistite: sample 7 of Camara and Oberti (2005)
- 10) lithiophilite: sample Trip06 of Losey et al. (2004)
- 11) cookeite: Zheng and Bailey (1997)
- 12) lithiophosphate: average values from data for two Li sites of Keffer et al. (1967)
- 13) eucryptite: average values from data for two Li sites of Daniels and Fyfe (2001)
- 14) quartz: theoretical values for the $[AlO_4/Li^+]^0$ cluster from Botis and Pan (2009)
- 15) albite: theoretical data of Deubener et al. (1991)

Methods

The analytical methods for Li isolation, purification, and isotope measurements are given in Magna et al. (2004). Lithium concentrations and isotope compositions in a subset of samples were measured using an *Element XR* sector-field–high-resolution–inductively coupled plasma–mass spectrometer (SF-HR-ICPMS; Thermo Scientific, Bremen, Germany) housed at the Freie Universität, Berlin. Lithium abundances and isotope compositions in a second subset of samples were determined using a *Neptune* multiple-collector ICPMS (Thermo Scientific, Bremen, Germany), housed at the Czech Geological Survey. The results are reported in the δ -notation relative to the L-SVEC reference solution (Flesch et al., 1973) and calculated as δ^7 Li (‰) = [(⁷Li/⁶Li)_{sample}/ (⁷Li/⁶Li)_{L-SVEC} –1] × 1000. The reproducibility of Li isotope measurements was assessed by replicate measurements of reference granite JG-2, rhyolite JR-2, and granodiorite JG-3 (Geological Survey of Japan), prepared together with the unknown samples (see Table DR2). The reproducibility was generally better than ±1.0‰ (2 s.d.; calculated from two to four individual measurements; cf. Košler et al., 2001; Misra and Froehlich, 2009) for SF-HR-ICPMS instrument while it was generally better than ± 0.4‰ (2 s.d.) for the MC-ICPMS instrument.

REFERENCE MAI	ERIALS			
		Li (ppm)	δ ⁷ Li (‰)	2 s.d.
Reference rocks				
JG-2 (GSJ)	Bt granite	39.9	0.22	0.21
	replicate		0.08	0.02
	replicate	39.5	-0.07	1.36
JG-3 (GSJ)	Hbl-Bt granodiorite	21.1	2.66	0.20
	<i>replicate</i> ^a	20.6	2.31	0.07
JR-2 (GSJ)	rhyolite		3.88	
	replicate	72.6	4.14	0.71
	replicate	74.2	4.07	0.14
	replicate ^a	76.5	3.86	0.31
	<i>replicate</i> ^a	73.2	3.96	0.18
40-5	spodumene, Tin Mountain	34130	7.43	0.20
	replicate		7.58	0.03
	replicate		7.43	0.69
	replicate ^a	34890	8.60	0.93
	replicate ^a		8.39	0.19
	replicate ^b		7.23	0.26
131-13	amblygonite, Tin Mountain	42830	11.16	0.42
	replicate	44550	11.52	0.65
	replicate ^a	36180	11.56	0.35
	replicate ^c		10.98	0.19

TABLE DR2: LITHIUM CONTENTS AND ISOTOPE COMPOSITIONS OFREFERENCE MATERIALS

^a measured using a *Neptune* MC-ICPMS

^b Magna et al. (2004)

^c unpublished data (T. Magna, 2006)

Bt – biotite; Hbl – hornblende. Replicate analysis indicates a full procedure, involving new sample dissolution, column chemistry and isotope measurements.

The results for reference rocks are consistent with published data (Chan and Frey, 2003; Jeffcoate et al., 2004; Jochum et al., 2006; Magna et al., 2011; Magna et al., 2010; Magna et al., 2004). The results for the 40–5 spodumene are in agreement with a previously published value (Magna et al., 2004); the results for 131–13 amblygonite are in agreement with unpublished data yielded using a *Nu 1700* MC-ICPMS (T. Magna, 2006).

TABLE DR3: LITHIUM CONTENTS, ISOTOPE COMPOSITIONS, AND IMPORTANT CRYSTALLOGRAPHICPARAMETERS OF MINERAL PHASES

			Effective				
Sample	Description	Note	coordination number	wtwiD L1–φ distance (Å) ^c	Li (ppm)	δ ⁷ Li (‰)	2 s.d.
Tanco (Canada)							
B-7859	muscovite	Р	5.982	2.213	2120	8.99	0.42
B-7838	beryl	Р	4.000	1.885	2740	32.00	1.09
B-7859b	beryl	Р	4.000	1.885	4270	28.19	0.18
MU 20967	petalite	Р	3.999	1.9424	20510	22.77	0.44
B-8200sqi	spodumene	SS (+Otz)	5.726	2.1953	22610	14.63	0.29
B-8200sp	spodumene	P	5.726	2.1953	33630	14.68	0.27
B-7827big	spodumene	Р	5.726	2.1953	31430	14.69	0.70
B-7827green	spodumene	Р	5.726	2.1953	23860	11.16	0.28
B-8200A	amblygonite	Р	4.649	2.049	44410	17.83	0.01
B-7173	amblygonite	Р	4.649	2.049	44190	17.29	0.21
B-7875A	amblygonite	Р	4.649	2.049	39720	12.31	0.55
B-7875L	lithiophilite	Р	5.882	2.153	40560	17.35	0.74
Stanek	elbaite	Р	5.817	2.021	5360	19.78	0.84
B-8192	lepidolite	Р	5.995	2.1213	16550	13.56	0.55
B-8194	lepidolite	Р	5.995	2.1213	17840	11.92	0.66
B-7886	lithiophosphate	LH	3.966	1.9758	154600	25.92	0.17
B-7934	eucryptite	LH (+Otz)	3.975	1.9852	39750	22.69	0.25
B-7928	cookeite	LH	5.999	2.110	3940	13.51	0.98
	holmquistite	Е	4.769	2.128	4130	10.96	0.65
Greenbushes (Austr	alia)						
SpGB ^a	spodumene	Р	5.726	2.1953	22970	5.96	0.18
HoGB ^a	holmquistite	Р	4.769	2.128	11270	5.91	0.24
Londonderry (Austr	alia)						
5.	lepidolite ^a	Р	5.995	2.1213	7840	-0.78	0.37
Bikita (Zimbabwe)	1						
MuBi ^a	muscovite	Р	5.982	2.213	1860	7.74	0.09
BeBi ^a	bervl	Р	4.000	1.885	3500	24.49	0.21
PeBi ^a	petalite	Р	3.999	1.9424	17160	10.96	0.33
SpBi ^a	spodumene	Р	5.726	2.1953	22670	1.07	0.12
SpBi2 ^a	spodumene	Р	5.726	2.1953	21400	6.14	0.18
LeBil ^a	muscovite	Р	5.995	2.1213	2930	2.16	0.33
LeBi2 ^a	lepidolite	Р	5.995	2.1213	12700	3.13	0.34
LeBi3 ^a	lepidolite	Р	5.995	2.1213	10050	2.30	0.22
Black Hills (USA)	1						
MuBH ^a	muscovite	Р	5.982	2.213	3100	8.37	0.26
11-3B ^b	muscovite	Р	5.982	2.213	2399	9.80	
19-1B ^b	muscovite	Р	5.982	2.213	2625	9.80	
TuBH ^a	tourmaline	Р	5.817	2.021	2390	9.18	0.17
BeBH ^a	bervl	Р	4.000	1.885	2390	33.59	0.21
18-1C ^b	spodumene	Р	5.726	2.1953	37300	8.30	
AmBH ^a	amblygonite	Р	4.649	2.049	59130	9.45	0.38
ElBH ^a	elbaite	Р	5.817	2.021	6640	11.42	0.26
LeBH ^a	lepidolite	Р	5.995	2.1213	24710	9.73	0.39
Nová Ves (Czech Re	epublic)						
Nová Ves	muscovite	Р	5.982	2.213	4520	-0.48	0.67
2920S	schorl	Р	5.817	2.021	773	3.13	0.39

2645S	beryl	Р	4.000	1.885	2480	16.26	0.23
7513	petalite	Р	3.999	1.9424	21060	8.30	0.15
B5450	petalite	SS (+Qtz)	3.999	1.9424	20380	10.56	0.22
a1319/61E	elbaite	Р	5.817	2.021	6470	4.81	0.31
a1943/58	lepidolite	P (+Qtz)	5.995	2.1213	14320	0.41	0.31
a319/61L	lepidolite	Р	5.995	2.1213	27930	1.35	0.30
Elba (Italy)							
TuE ^a	schorl	Р	5.817	2.021	590	1.78	0.07
BeE ^a	beryl	Р	4.000	1.885	3170	11.33	0.20
PeE1 ^a	petalite	Р	3.999	1.9424	18570	5.73	0.17
PeE2 ^a	petalite	Р	3.999	1.9424	17740	5.57	0.17
LeE ^a	lepidolite	Р	5.995	2.1213	19270	-1.99	0.57

P = primary (~500–400°C), SS = sub-solidus after petalite (~500–400°C), LH = late hydrothermal after spodumene (~300–200°C), E = exo-contact (~500–400°C); Qtz – quartz

^a measured using a *Neptune* MC-ICPMS

^b Teng et al. (2006)

 c weighted mean distance of sites containing Li and ϕ atoms (ϕ = O, OH, F), see

Crystallographic data for details.

TABLE DR4: COMPARISON OF L1 POLYHEDRA GEOMETRIC PARAMETERS IN STUDIED MINERALS.									
Mineral	ECoN	WtMD Li– φ (Å)	Li-site atoms	φ atoms	Arbitrary coordination number	Average bond length Li– φ (Å)			
beryl	4.000	1.885	Li	O_4	4	1.885			
petalite	3.999	1.9424	Li	O_4	4	1.9424			
lithiophosphate	3.966	1.9758	Li	O_4	4	1.955			
eucryptite	3.975	1.9852	Li	O_4	4	1.9810			
elbaite & schorl	5.817	2.021	Li, Al, Fe	$O_4(OH,F)_2$	6	2.033			
amblygonite	4.649	2.049	Li	$O_4 + (F_{0.55}OH_{0.45})$	5	2.058			
cookeite	5.999	2.110	Al > Li	$O_4(OH)_2$	6	2.1102			
lepidolite	5.995	2.1213	Li, Al	$O_4(F,OH)_2$	6	2.1216			
holmquistite	4.769	2.128	Li	O_5	5	2.1509			
lithiophilite	5.882	2.153	Li	O_6	6	2.161			
spodumene	5.726	2.1953	Li	O_6	6	2.2135			
muscovite	5.982	2.213	Al > Li	$O_4(OH,F)_2$	6	2.214			
quartz	3.941	1.936	Li	O_4	4	1.934			
albite	4.949	2.278	Li	O_5	5	2.284			

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