

Приложение к статье
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МЕСТОРОЖДЕНИЯ ЛИТИЯ ОТ МЕЗОАРХЕЯ ДО СОВРЕМЕННОГО ПЕРИОДА: ИХ ТИПЫ, РАСПРЕДЕЛЕНИЕ В ГЕОЛОГИЧЕСКОМ
ВРЕМЕНИ, РАЗВЕДАННАЯ РЕСУРСНАЯ БАЗА

Месторождения лития, вошедшие в выборку для анализа, их тип, возможные попутные компоненты, минералы-концентраторы лития, геохронологические данные и основные использованные источники информации

№	Месторождение ¹	Тип ²	Попутные компоненты ³	Концентраторы Li ⁴	Возраст ⁵ (млн лет), минерал ⁶ , порода ⁷	Ссылки	
						геохронология	геология
1	<i>Пилгангура</i>	P	Ta, Sn, Be	spd	2879±5, tn, p	Kinny, 2000	Sweetapple et al., 2017
2	<i>Воджина</i>	P	Ta , Sn, Be	spd	2863±12, cs+tn, p	Dittrich et al., 2019	Dittrich et al., 2019
3	Арчер	P	Sn, Ta	spd	2843±9, cs, p	Kendall-Langley et al., 2020	Global..., 2022
4	Пэйкагама	P	Ta, Cs, Rb	spd, lpd	2670±5, tn, p	Smith et al., 2004	McCracken et al., 2021
5	Спарк	P	Ta, Cs, Rb	spd, lpd	2670±5, tn, p	Smith et al., 2004	McCracken et al., 2021
6	Моблан	P		spd	2678±2, mz, g	Davis et al., 1995	Maneta, Baker, 2019
7	Сеймур-Лэйк	P		spd	2666±6, tn, p	Breaks et al., 2006	Breaks et al., 2006
8	Нама-Крик	P		spd	2653+3/-4, mz, p	Percival, Sullivan, 1988	Breaks et al., 2008
9	Рут-Бэй	P	Ta	spd	2669 ±2, zn+mz	Corfu et al., 1995	Magyarosi, 2016
10	<i>Сепарейшин-Рэпидз</i>	P	Rb, Ta	ptl, lpd, spd	2644±7, tn, p	Smith et al., 2004	Breaks, Tindle, 2001
11	<i>Танко</i>	P	Ta , Cs, Be	ptl, spd, lpd	2641±3, tn, p	Camacho et al., 2012	Černý, 2005.
12	<i>Лакорн</i>	P		spd	2643±4, zn, g	Feng, Kerrich, 1991	Boily et al., 1990
13	Отъе	P		spd	2639±2, mz, p	Ducharme et al., 1997	Boily et al., 1990
14	<i>Кэтлин-Вэлли</i>	P	Ta	spd, lpd	2640±8, tn, p	Dittrich et al., 2019	Phelps-Barber et al., 2022
15	Маунт-Айда	P	Ta	spd, lpd	2640±8, zn, g	Nelson, 1996	Delta..., 2023

16	Анна	P	Ta	spd	2642±7, cs+tn, p	Dittrich et al., 2019	Phelps-Barber et al., 2022
17	Болд-Хилл	P	Ta, Sn	spd	2630±8, tn, p	Kendall-Langley et al., 2020	Jacobson et al., 2007
18	Манна	P	Ta	spd	2630±8, tn, p	Kendall-Langley et al., 2020	Phelps-Barber et al., 2022
19	Маунт-Мэрион	P		spd	2627±6, tn, p	Kendall-Langley et al., 2020	Smith, Ross, 2017
20	Пионердоум-Норт	P	Ta	spd	2627±6, tn, p	Kendall-Langley et al., 2020	Phelps-Barber et al., 2022
21	Эрл-Грей	P	Ta	spd, ptl, ckt, ecr	2628±10, fs+gt, p	Kent et al., 1996	Phelps-Barber et al., 2022
22	Маунт-Кэттлин	P	Ta, Be	spd, lpd, amb	2626±13, tn, p	Dittrich et al., 2019	Dittrich et al., 2019
23	Бикита	P	Cs, Be, Ta, Sn	ptl, spd, lpd, ecr, amb	2617±1, tn, p	Melcher et al., 2015	Dittrich et al., 2019
24	Зулу	P	Ta	ptl, spd, lpd	2617±1, tn, p	Melcher et al., 2015	Pooley et al., 2023
25	Аркадия	P	Ta	spd, ptl	2601±14, zn, g	Jelsma et al, 1996	Prospect Resources, 2021
26	Саби-Стар	P	Ta	spd	2617±1, tn, p	Melcher et al., 2015	Ackermann et al., 1968
27	Колмозерское	P	Ta, Be	spd	2607±9, zn, p	Кудряшов и др., 2022	Морозова, 2018
28	Полмостундровское	P	Ta, Be	spd	2607±9, zn, p	Кудряшов и др., 2022	Коровкин и др., 2003
29	Корветт CV5	P	Ta	spd	2618 ± 2, zn, g	Goutier et al., 2000	McCracken, Cunningham, 2023
30	Хиден-Лэйк	P		spd	2586±2, mz, g	Davis, Bleeker, 1999	Černý, 1990
31	Рид-Лэйк–Хардинг-Лэйк	P		spd	2586±2, mz, g	Davis, Bleeker, 1999	Černý, 1990
32	Бигхилл-Лэйк	P		spd	2586±2, mz, g	Davis, Bleeker, 1999	Černý, 1990
33	Тор	P		spd	2562±15, tn, p	Anderson et al., 2013	Černý, 1990
34	Вабуши	P	Be	spd, ptl	2577±13, zn, p	Beland, 2011	Morisette et al., 2022
35	Джеймс-Бэй	P		spd, lpd	2577±13, zn, p	Beland, 2011	Bernier, 2010
36	Роуз	P	Ta, Rb, Cs, Be	spd, lpd	2577±13, zn, p	Beland, 2011	Richard et al., 2017

37	<i>Гринбушес</i>	P	Ta, Sn, Nb	spd	2527±2, zn, p	Partington et al., 1995	Partington et al., 1995
38	Эвояа	P		spd	2079.6±3.1, tn, p	Melcher et al., 2015	Atlantic..., 2022
39	Бугуни	P		spd	2095±11, zn, g	Parra-Avila et al., 2017	Kodal..., 2020
40	<i>Гуламина</i>	P		spd	2095±11, zn, g	Parra-Avila et al., 2017	Wilde et al., 2021
41	Надия–Станковатское	P	Ta, Sn, Nb, Rb, Be	ptl, spd, tfl	2026.9±0.6, mz, g	Stepanyuk et al., 2021	Гурский и др., 2005
42	Полоховское	P	Sn, Ta, Rb, Be	ptl, spd, tfl	2026.9±0.6, mz, g	Stepanyuk et al., 2021	Гурский и др., 2005
43	<i>Вольта-Гранде</i>	P	Ta, Sn	spd, lpd	2025±5, tn, p	Melcher et al., 2017	Lagach, Quemeneur, 1997
44	Вишняковское	P	Ta, Be, Sn, Cs, Rb	spd, ptl, ecr, lpd	1838±3, tn, p	Сальникова и др., 2011	Загорский и др., 1997
45	Белореченское	P	Ta, Be	spd	1824±7, tn, p	Сальникова и др., 2010	Загорский и др., 1997
46	Гольцовое	P	Ta, Cs, Be, Nb	spd	1824±7, tn, p	Сальникова и др., 2010	Загорский и др., 1997
47	Урикское	P	Ta	spd	1824±7, tn, p	Сальникова и др., 2010	Загорский и др., 1997
48	<i>Рапасаарет-Оутовеси</i>	P		spd	1789±2, tn, p	Alviola et al., 2001	Ahtola et al., 2015
49	Векуско-Лэйк	P		spd	1780 ±8.1, tn, p	Benn et al., 2019	Benn et al., 2018
50	Финнисс	P	Sn, Ta	spd	1733±13, tn, p	Frater, 2005	Frater, 2005
51	Камативи	P	Sn, Ta, Nb, Be	spd	1037±5, tn, p	Melcher et al., 2015	Shaw et al., 2022
52	Манано – Китотоло	P	Sn, Ta	spd	947.3±2.8, tn, p	Melcher et al., 2015	Dewaele et al., 2015
53	<i>Кентича</i>	P	Ta, Nb	spd	530.2±1.3, tn, p	Küster et al., 2009	Bekele, Sen, 2023
54	<i>Юис</i>	P	Sn, Ta	ptl, amb, ckt, ecr	503.8±5.9, cs, p	Zhang et al., 2016	Fuchsloch et al., 2019
55	<i>Итинга</i>	P	Ta, Sn	spd, ptl	501.8 ±3.0, tn, p	Melcher et al., 2017	Paes et al., 2016
56	Колина	P		spd	501.8 ±3.0, tn, p	Melcher et al., 2017	Paes et al., 2016
57	Тастыгское	P	Ta, Be, Sn, Nb	spd	483±13, zn, p	Кузнецова и др., 2018	Загорский и др., 1997

58	Вознесенское	G	F, Zn, Sn, Be, Cs, Rb, Ta	lpd	481±7, zn, g	Rizvanova et al., 2021	Линде и др., 2000
59	Тогайлэкэ	P	Be	lpd	459.9±3.7, zn, p	Xu et al., 2019	Zhang H. et al., 2022
60	Черривиль	P		spd	355±2, zn, g	Mapes, 2002	Swanson, 2012
61	<u>Холлман-Бим</u>	P	Sn	spd	355±2, zn, g	Mapes, 2002	Swanson, 2012
62	<u>Кингз-Маунтин</u>	P	Sn, Ta, Be, Nb	spd	340±10, wr, p	Kish, Fullagar, 1996	Swanson, 2012
63	Архемела	G	Sn	amb, lpd	326±3, tn, g	Melleton et al., 2022	Inverno et al., 2019
64	Задисдорф	G	Sn, W, Cu	znw	326.1±3.4, cs, h	Zhang et al., 2017	Lithium..., 2017
65	Циновец – Циннвальд	G	Sn, W, K, Rb	znw	321.5±3.1, cs, h	Zhang et al., 2017	Breiter et al., 2019
66	Эшассьер	G	Ta, Sn, Be, W	lpd, znw, amb	317±6, tn, g	Melleton et al., 2015	Raimbeault et al., 1995
67	Альберта	P	Ta, Sn	spd, ptl, amb, ecr	311±4, tn, p	Melleton et al., 2022	Fuertes Fuente M., Martin-Izard, 1998
68	Барросу	P		spd, ptl, ecr	308±4, tn, p	Melleton et al., 2022	Martins et al, 2012
69	Сепеда	P	Sn	ptl, spd	308±4, tn, p	Melleton et al., 2022	Martins et al, 2012
70	Лас-Навас	P	Sn	lpd, amb, spd	311.0±0.5, zn+mz, g	Antunes et al., 2013	Gallego Garrido, 1992
71	Вальдефлорес	G	Sn, W	znw, lpd, amb	305±2, zn, g	Rubio-Ordóñez et al., 2016	Pesquera et al., 2020
72	Пламбаго-Норт	P		spd, amb, tfl	295.0±3.7, ms, p	Bradley et al., 2016	Simmons et al., 2020
73	Трелавур	G	Rb, Cs	znw, lpd	273.9±0.8, ms, g	Chesley et al., 1993	Simons et al., 2017
74	Ганхис	G		znw	276.7 ± 0.9, ms, g	Chesley et al., 1993	Williamson et al., 1997
75	Вайнебене	P		spd	263.4±8.6, wr+gr+tm, p	Knoll et al., 2018	Keyser et al., 2023
76	Шавазсай	G		lpd, tai, smt, phg, vg, cbm	263±2, wr+ms, o	Мамарозиков и др., 2012	Мамарозиков и др., 2012
77	<u>Коктогай</u>	P	Be, Ta, Cs, Nb	spd, amb, lpd	219.8 ±1.3, tn, p	Shen et al., 2022	Shen et al., 2022
78	<u>Цзяцзика</u>	P	Be, Ta, Nb	spd	214±2, tn, p	Tao et al., 2020	Tao et al., 2020

79	Мужун	P	Be, Ta, Nb, Rb	spd	214±2, tn, p	Tao et al., 2020	Li J. et al., 2023
80	<i>Лицзягоу</i>	P	Ta, Nb, Be, Sn	spd	211.2±1.0, tn, p	Fei et al., 2020 ₁	Fei et al., 2020 ₁
81	<i>Елунгоу</i>	P	Ta, Be, Sn	spd	211.2±1.0, tn, p	Fei et al., 2020 ₁	Fei et al., 2018
82	Сэцзэмуцзу	P	Rb, Be, Sn, Ta	spd, lpd	209.1±0.7, zn, g	Li et al., 2022	Yue et al., 2018
83	<i>Даньба</i>	P	Ta	spd	208.1±1.9, cs, p	Fei et al., 2020 ₂	Fei et al., 2020 ₂
84	Цзяда	P		spd, lpd	204.7±1.0, tn, p	Li et al., 2022	Li et al., 2022
85	Байлуншань	P	Rb, Ta, Sn, Be, Nb	spd, amb, lpd	208.1±1.5, tn, p	Wang et al., 2020	Wang et al., 2020
86	Сюэфэнлин	P	Be, Rb, Nb, Ta	spd	206.3±1.8, tn, p	Yan et al., 2022	Yan et al., 2022
87	Чжаулун	P		spd, lpd	204.5±1.8	Li et al., 2019	Li et al., 2019
88	Алахинское	G	Ta	spd, phg, amb	198.6±1.1, wr, g	Kostitsyn et al., 1998	Анникова и др., 2016
89	Хухдел ⁸	C	K, Cs, Rb, Sr	ilt, smt	155±1, fs, t	Graham et al., 2001	Gerel et al., 2021
90	<i>Ичунь</i>	G	Ta, Cs, Rb, Sn, Nb	lpd, znw	161.0±1.0, tn, g	Che et al., 2015	Pollard, 2021
91	Чжэнчун	G	Rb, Cs, Ta, Sn, W	znw	149.9±0.5, mz, g	Liu et al., 2022	Liu et al., 2022
92	Дантянь	G		znw, lpd	144±5, tn, g	Xie et al., 2019	Wu et al., 2016
93	Сикэн	G		lpd	139.1±0.6, ms, h	Nie et al., 2022	Nie et al., 2022
94	<i>Даган</i>	G	Rb, Cs, Ta, Sn	lpd	144±5, tn, g	Xie et al., 2019	Li et al., 2020
95	Суншуган	G	Ta, Nb, W, Sn, Rb	znw	129±1, tn, g	Che et al., 2019	Zhu et al., 2015
96	Вэйласыто	G	Sn, W, Rb	phg	135±2, zn, g	Liu et al., 2016	Shi et al., 2021
97	Орловское	G	Ta, Rb, Nb	lpd	139.9±1.9, zn, g	Абушкевич, Сырицо, 2007	Линде и др., 2000
98	<u>Завитинское</u>	P	Ta, Sn, Nb, Be	spd	129.6±2.7, zn, p	Загорский и др., 2015	Загорский и др., 1997
99	Кестёр	G	Sn, Ta	amb, lpd	122±7, wr, g	Трунилина и др., 2008	Линде и др., 2000

100	Парун	P	Ta, Be	spd, amb	28, ms+fs	Стажило-Алексеев, 2012	Cocker, 2011
101	Шамакат	P		spd, ptl	28, ms+fs	Стажило-Алексеев, 2012	Cocker, 2011
102	Тагавлор	P	Ta, Sn	spd, ptl	29, ms, g	Стажило-Алексеев, 2012	Стажило-Алексеев, 2012
103	Цюнцзяган	P	Be, Ta, Nb	spd	24.9±0.3, tn, p	Zhao et al., 2021	Zhao et al., 2021
104	Фальчани	G		vgl	7.5±0.5, ms, r	Cheilletz et al., 1992	Riordan et al., 2020
105	Ядар	C	B , Na	jdt	14.7±0.1, fs, t	Sant et al., 2018	Rio Tinto, 2022
106	Валево	C	B	smt	14.7±0.1, fs, t	Sant et al., 2018	Borojević Šoštarić, Brenko, 2023
107	<i>Такер-Пасс</i>	C	K	ilt, smt, ilt-smt	14.9±0.1, fs, h	Castor, Henry, 2020	Ehsani et al., 2018
108	Кингс-Вэлли 2	C	K	smt, ilt, ilt-smt	14.9±0.1, fs, h	Castor, Henry, 2020	Carew, Rossi, 2016
109	Макдермитт-Норт	C		smt, ilt-smc	14.9±0.1, fs, h	Castor, Henry, 2020	Jindalee..., 2023
110	Тонопа	C		smt, ilt-smt, ilt	15.5±0.8, fs, t	du Bray et al., 2019	Loveday, Turner, 2020
111	<i>Риолит-Ридж</i>	C	B	ilt, smt, ilt-smt	6.2±0.5, bt, t	Stewart, Diamond, 1990	Fluor..., 2022
112	Зевс	C		ilt, smt	11.4±0.2, bt, t	Evernden et al., 1964	Cukor, Hilscher, 2023
113	Клэйтон-Вэлли	C		ilt, smt	11.4±0.2, bt, t	Evernden et al., 1964	Fayram et al., 2021
114	Макджи	C		ilt,smt, ilt-smt	11.4±0.2, bt, t	Evernden et al., 1964	Loveday, Kartick, 2022
115	Бонни-Клэр	C		ilt	<2.5, gc	Samari et al., 2022	Samari et al., 2022
116	Форт-Кэйди	C	B	ilt, smt	ок. 5, gc	Kerr, 2021	Kerr, 2021
117	Биг-Сэнди	C		smt, ilt	ок. 5, gc	Sheppard, Gude, 1972	Hawkstone..., 2019
118	Бэйсин	C	K	smt, ilt, ptl	ок. 5, gc	Pittuck, 2023	Pittuck, 2023
119	<i>Сонора</i>	C	K, Rb, Cs, Mg	smt, ilt	ок. 12, gc	Pittuck et al., 2018	Pittuck et al., 2018
120	<i>Силвер-Пик</i>	S		bn	–	–	SRK Consulting, 2021
121	<i>Сёрлз-Лейк</i>	S	B, Na , K	bn	–	–	Lowenstein et al., 2016

122	<i>Салар-де-Уюни</i>	S	K, B, Mg	bn	—	—	Sieland, 2014
123	<i>Салар-де-Атакама</i>	S	K , Mg, B	bn	—	—	Godfrey, Álvarez-Amado, 2020
124	<i>Салар-де-Оларос</i>	S		bn	—	—	Godfrey, Álvarez-Amado, 2020
125	<i>Салар-де-Каучари</i>	S		bn	—	—	Gozalvez et al., 2023
126	Салар-дель-Ринкон	S	K, Na	bn	—	—	Godfrey, Álvarez-Amado, 2020
127	Пастос-Грандес	S	K	bn	—	—	Dworzanowski et al., 2019
128	Салар-де-Посуэлос	S		bn	—	—	Alvarez et al., 2019
129	Салар-де-Льюльяйльяко	S	K, B	bn	—	—	Bessler et al., 2018
130	<i>Сентенарио-Ратонес</i>	S ⁸		bn	—	—	Gozalvez et al., 2023
131	Салар-де-Рио-Гранде	S		bn	—	—	Godfrey, Álvarez-Amado, 2020
132	Саль-де-Лос-Анхелес	S	K	bn	—	—	Reidel, 2016
133	<i>Салар-дель-Омбре-Муэрто</i>	S	K, B	bn	—	—	Vivante, Alonso, 2006
134	Канделас	S	K	bn	—	—	Galan..., 2021
135	Качи	S	K	bn	—	—	Lake Resources, 2018
136	Салар-де-Марикунга	S	K	bn	—	—	Reidel, 2021
137	<i>Трес-Кебрадас</i>	S	B, K	bn	—	—	King, Dworzanowski, 2021
138	Кушуй	S	B, K	bn	—	—	Li Y. et al., 2023
139	<i>Лунмуцо</i>	S	B, K	bn	—	—	Bian et al., 2013
140	<i>Цзабуе</i>	S	B , K	bn	—	—	Ding et al., 2023
141	Лагоцо	S	B	bn	—	—	Zhang, Li, 2023
142	<i>Дансюнцо</i>	S	K, B	bn	—	—	Nie et al., 2020

143	<i>Илипин</i>	S	K, B, Mg	bn	—	—	Yu et al., 2013
144	<i>Си-Тайцзинайэр</i>	S	K, B, Mg	bn	—	—	Yu et al., 2013
145	<i>Дун-Тайцзинайэр</i>	S	K, B, Mg	bn	—	—	Yu et al., 2013
146	<i>Чэрхань</i>	S	K , Mg, B	bn	—	—	Ding et al., 2023
147	<i>Дачайдань</i>	S	K, B , Na, Mg, Br	bn	—	—	Zheng et al., 2016
148	Ортенау	GT	TE	bn	—	—	Vulcan Energy..., 2023
149	<i>Инсхайм–Ландау</i>	GT	TE	bn	—	—	Vulcan Energy..., 2023
150	<i>Таро–Кернер</i>	GT	TE	bn	—	—	Vulcan Energy..., 2023
151	Флаггентурм	GT	TE		—	—	Vulcan Energy..., 2023
152	Мангейм–Терезе	GT	TE		—	—	Vulcan Energy..., 2023
153	Солтон-Си	GT	TE	bn	—	—	McKibben et al., 2021
154	Тарумовское	GT	TE , Mg, Na	bn	—	—	Саркаров и др., 2022
155	<i>Смэкоувер-Ланзесс</i>	OG	Br	bn	—	—	Brush et al., 2023
156	Смэкоувер-Тетра	OG		bn	—	—	Gay et al., 2023
157	Бэшо	OG		bn	—	—	Abbey et al., 2023
158	Бордвок	OG		bn	—	—	Eccles et al., 2022
159	Пис-Ривер	OG		bn	—	—	MacMillan, 2023
160	Прэари	OG		bn	—	—	Arizona..., 2023
161	Мансур	OG		bn	—	—	Else, 2023
162	Вьюфилд	OG		bn	—	—	Else, 2023
163	Парадокс	OG	Br	bn	—	—	Anson..., 2023
164	Ковыктинское	OG	Br, Mg	bn	—	—	Alexeev et al., 2020

Примечания:

¹ месторождения, обрабатываемые или обрабатывавшиеся прежде с извлечением лития в промышленных масштабах, выделены полужирным курсивом (законсервированные подчеркнуты); месторождения, на которых строятся эксплуатационные комплексы с запланированным началом промышленной отработки на литий в течение ближайших 1-2 лет, выделены простым курсивом;

² согласно табл. 1;

³ оцененные, но не обязательно извлекаемые, в порядке убывающей значимости для месторождения; компоненты, выделенные жирным шрифтом, как минимум, не уступают по значимости литию в данном месторождении;

⁴ в порядке убывающей значимости для суммарных ресурсов месторождения; принятые сокращения: amb – амблигонит–монтебразит, bp – рассол, clm – глинистые минералы (без дифференциации), cbm – углистое вещество, ckt – кукцит, ecr – эвкрипит, ilt – иллит, jdt – ядарит, klt – каолинит, lpd – лепидолит, литиевый мусковит, phg – литиевый фенгит, plt – полилитионит, ptl – петалит, smt – минералы группы смектита (гекторит, монтмориллонит, сапонит, свайнфордит), spd – сподумен, tai – тайниолит, tfl – трифилин–литофилит, vgl – вулканическое стекло, пепел, zpw – циннвальдит;

⁵ курсивом выделены датировки, полученные на геологическом аналоге данного объекта, расположенном в том же районе;

⁶ bt – биотит, cs – касситерит, fs – полевошпат, gc – геологическая корреляция по комплексу геологических и геохронологических данных в этом районе, gt – гранат, ms – мусковит/серицит/лепидолит, mz – монацит, tm – турмалин, tp – танталониобаты, wt – валовая проба, zp – циркон;

⁷ g – гранит материнского комплекса, h – гидротермально-метасоматические породы (грейзены, рудные жилы, синрудные метасоматиты и т.п.), o – онгонит, p – пегматит, r – риолит, t – туф

⁸ для этого и большинства других месторождений глинистого типа указан возраст вмещающих пород, которые древнее рудной минерализации, но согласно существующим геолого-генетическим моделям кайнозойских месторождений данного типа (Borojević Šoštarić, Brenko, 2023; Castor, Henry, 2020; Coffey et al., 2021), эта разница в возрасте в пределах нескольких млн лет.

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