

Table S1. Data Sources

Authors	Location	Rock type	No. Analyses (Type)
Ahmed et al., 1985	Pakistan	Pegmatite	2 (Peg)
Ahmed & Hariri, 2006	Saudi Arabia	Skarn	6 (Met)
Aldahan & Morad, 1986	Norway	Authigenic in sandstones	12 (Hyd)
Alderton, 1988	England	Secondary in granite	1 (Hyd)
Alderton, 1988	England	Granite	1 (Plu)
Alderton, personal comm.	England	Secondary in granite	22 (Hyd)
Aleinkoff et al., 2002	Connecticut	Orthogneiss	3 (Met)
Aleksandrov and Troneva, 2007	Russia	Skarn	5 (Met)
Aleksandrov and Troneva, 2007	New South Wales	Skarn	1 (Met)
Aleksandrov and Troneva, 2007	Tasmania	Skarn	7 (Met)
Anand and Balakrishnan, 2011	India	Granitoid	6 (Plu)
Avchenko et al., 2012	Russia	Metasomatized rocks	17 (Met)
Ayuso, 1984	Maine	Granite	5 (Plu)
Bancroft et al., 1987	Ontario	Gneiss	3 (Met)
Barth (unpublished data)	California	Granodiorite, Triassic	134 (Plu)
Baudouin and Parat, 2015	Morocco	Phonolite	1 (SiU)
Baudouin and Parat, 2015	Germany	Phonolite	1 (SiU)
Baudouin et al., 2016	Tanzania	Nephelinite lavas	2 (SiU)
Bauer, 2015	California	Granite	216 (Plu)
Bernau & Franz, 1987	Greece	Piemontite-albite gneiss	3 (Met)
Bernau & Franz, 1987	Egypt	Calc-silicate	13 (Met)
Bilgrami & Howie, 1960	Pakistan	Rodingite	1 (Met)
Birch, 1983	Victoria	Cavities in granodiorite	1 (Hyd)
Birch, 1985	Victoria	Calc-silicate	1 (Met)
Boles and Coombs, 1977	New Zealand	Authigenic in sediments	5 (Hyd)
Boudy et al., 1997	Western Norway	Granulite-eclogite	2 (Met)
Broska & Petrik, 2015	Slovakia	Granite	7 (Plu)
Broska & Petrik, 2015	Slovakia	Hydrothermal in granite	2 (Hyd)
Broska et al., 2007	Slovakia	Tonalite	11 (Plu)
Broska et al., 2004	Slovakia	I-type granitoids	10 (Plu)
Campbell et al., 1995	New Mexico	REE-U-Th veins	2 (Hyd)
Campos et al., 2016	Brazil	High-K granitoid	3 (Plu)
Cao et al., 2015	China	Porphyry Cu deposit	9 (Hyd)
Carcangui et al., 1997	Italy	Metasomatic in granodiorite	3 (Hyd)
Carmichael, 1970	Ontario	Calc-silicate	4 (Met)
Carswell et al., 1996	China	Eclogite	8 (Met)
Castelli and Rubatto, 2002	Italy	Metacarbonate	10 (Met)
Castelli et al., 2007	Italy	Marble UHP	2 (Met)
Cave et al., 2015	New Zealand	Greywacke & argillite	18 (Met)
Cave et al., 2015	New Zealand	Detrital, likely plutonic	3 (Plu)
Cempirek et al., 2008	Czech Republic	Skarn	9 (Met)
Cerny et al., 1995	Czech Republic	Pegmatite	10 (Peg)
Chakhmouradian, 2004	Russia	Hydrothermal in carbonates	31 (Hyd)
Che et al., 2013	Western Canada	Hornfels	4 (Hyd)
Che et al., 2013	Western Canada	Altered granodiorite	6 (Hyd)
Che et al., 2013	Western Canada	Granodiorite	8 (Plu)
Che et al., 2013	Western Canada	Skarn	9 (Hyd)
Chen et al., 2016	China	Metagranite	7 (Met)
Christiansen et al., 2015	Utah	Bentonites Late Jurassic	529 (Vol)
Clark, 1974	Italy	Pegmatite	1 (Peg)
Colombini et al., 2011	Nevada	Dacite mingled lava	5 (Vol)
Colombini et al., 2011	Nevada	Rhyolite tuff	5 (Vol)
Colombini et al., 2011	Nevada	Rhyolite lava	5 (Vol)
Cong et al., 1995	China	Eclogite and UHP schist	15 (Met)
Coombs et al., 1976	Switzerland	Schist	2 (Met)
Corlett and McIlreath, 1974	Ontario	Gneiss	2 (Met)
Cotkin, 1987	California	Blueschist	2 (Met)
Coulson & Chambers, 1996	Greenland	Metasomatised basalt	1 (Met)
Coulson & Chambers, 1996	Greenland	Metasomatised gneiss	2 (Met)
Coulson & Chambers, 1996	Greenland	Metasomatised syenite	3 (Met)
Coulson & Chambers, 1996	Greenland	Metasomatised sediment	4 (Met)
Cundari, 1979	Italy	Leucite lava - phonolite	1 (SiU)
Dahlquist, 2001	Argentina	Granitoids	2 (Plu)
Dawson, 1998	Tanzania	Nephelinite	4 (SiU)
Dawson & Hill, 1998	Tanzania	Nephelinite lava	5 (SiU)
Dawson et al., 1995	Tanzania	Ijolite	4 (SiU)
Dawson et al., 1995	Tanzania	Nepheline syenite	5 (SiU)
De Ros et al., 1994	Brazil	Authigenic in sandstones	1 (Hyd)
Della Ventura et al., 1999	Italy	Alkali syenite lava	7 (SiU)
Deng et al., 2015	China	Altered Diabase Dike	9 (Hyd)
Deng et al., 2015	China	Quartz Diorite	14 (Plu)
Deng et al., 2015	China	Skarn	18 (Hyd)
Dilles, 1984	Nevada	Gabbro	1 (Plu)
Dilles, 1984	Nevada	Granodiorite	1 (Plu)

Dilles, 1984	Nevada	Diorite	1 (Plu)
Dilles, 1984	Nevada	Quartz monzonite	3 (Plu)
Dilles, 1984	Nevada	Porphyry copper	6 (Hyd)
Ercit et al., 2003	NWT, Canada	Pegmatite	1 (Peg)
Enami et al., 1993	Japan	Granitoid	3 (Met)
Enami et al., 1993	California	Meta-sediments	13 (Met)
Endo et al., 2013	Japan	Garnet amphibolite/eclogite	1 (Met)
Ernst & Dal Piaz, 1978	Italy	Eclogite	6 (Met)
Estrada et al., 2015	Madagascar	Skarn	2 (Hyd)
Exley, 1980	Scotland	Granite	4 (Plu)
Ferguson, 1978	Canary Islands	Nepheline syenite	1 (SiU)
Flohr and Ross, 1989	Arkansas	Ijolite	3 (SiU)
Flohr and Ross, 1990	Arkansas	Pseudoleucite syenite	1 (SiU)
Flohr and Ross, 1990	Arkansas	Nepheline syenite	5 (SiU)
Foord et al., 1993	Montana	Pegmatite	2 (Peg)
Förster and Förster (unpub. data)	Germany	Syenite	20 (Plu)
Franz & Spear, 1985	Austria	Eclogite	21 (Met)
Franzen (new BYU data)	Utah	Granite, Cenozoic	771 (Plu)
Fu et al., 2016	Yunnan, China	Quartz syenite porphyry	8 (Plu)
Fu et al., 2016	Yunnan, China	Secondary in syenite	28 (Hyd)
Fu et al., 2018	Yunnan, China	Granite porphyry	12 (Plu)
Fu et al., 2018	Yunnan, China	Co, Mo, Au skarn	25 (Hyd)
Gao et al., 2012	Dabie, China	Metagranite ultra-HP	25 (Met)
Gao et al., 2012	Dabie, China	Relict magmatic	10 (Plu)
Garber et al., 2017	Norway	Granite	3 (Plu)
Garber et al., 2017	Norway	Gneiss	8 (Met)
Ghent & Stout, 1984	Canada	Metabasite	11 (Met)
Giannetti & Luhr, 1983	Italy	Phonolite	2 (SiU)
Giannetti & Luhr, 1983	Italy	Trachyte	3 (SiU)
Giere & Williams, 1992	Italy	Hydrothermal veins in skarn	6 (Hyd)
Giere, 1992	Italy	Hydrothermal veins	10 (Hyd)
Gil (unpub. data Research Gate)	Poland	Jordanow nephrite	1 (SiU)
Gilotti, 1989	Sweden	Metadiabase dike	1 (Met)
Gogoi et al., 2017	India	Granite	19 (Plu)
Gomez-Pugnaire et al. 1997	Northern Urals	Eclogite	1 (Met)
Gomez-Pugnaire et al. 1997	Northern Urals	Blueschist	2 (Met)
Grapes & Watanabe, 1992	New Zealand	Metagreywacke	24 (Met)
Groat et al., 1985	Manitoba	Pegmatite	4 (Peg)
Gromet & Silver, 1983	California	Granite/granodiorite	2 (Plu)
Guo et al., 2014	China	Eclogite	22 (Met)
Hammarstrom, 1990	Montana	Granite to granodiorite	43 (Plu)
Hansen et al., 2010	Michigan	Low-grade metabasalts	3 (Met)
Harlov and Förster, 2003	Italy	Amphibolite facies rocks	4 (Met)
Harlov et al., 2006	Austria	Felsic to intermediate	3 (Met)
Harlov et al., 2006	Southern India	Felsic to intermediate	5 (Met)
Harlov et al., 2006	Norway	Felsic to intermediate	5 (Met)
Harlov et al., 2006	Italy	Felsic to intermediate	5 (Met)
Hartel & Pattison, 1996	Ontario	Mafic granulite	3 (Met)
Hatert et al., 1996	Belgium	Quartz veins in gneiss	1 (Met)
He et al., 2017	China	REE-rich granites	2 (Plu)
Helmy et al., 2004	Egypt	Calc-alkaline granitoids	14 (Plu)
Henderson, 1980	Greenland	Alkaline intrusion	1 (SiU)
Henze (new BYU data)	Utah	Granite, Jurassic	488 (Plu)
Hole et al., 1992	Scotland	Authigenic in sandstones	5 (Hyd)
Holenyi & Annersten, 1987	Germany	Sanidine volcanic rock	1 (SiU)
Holenyi & Annersten, 1987	Sweden	Metasedimentary rock	1 (Met)
Horie et al., 2008	Gabon	Hydrothermal in tuff	6 (Hyd)
Houzar et al., 2008	Czech Republic	Skarn	11 (Hyd)
Hu et al., 2017a	China	Monzogranite	76 (Plu)
Hu et al., 2017b	China	Fe Skarn	10 (Hyd)
Ismail et al., 2014	South Australia	Cu Au deposit	9 (Hyd)
Itaya et al., 1985	New Caledonia	High P schists	6 (Met)
Ivanuk et al., 2016	Russia	Foidite	6 (SiU)
Janeczek & Sachanbinski, 1992	Poland	Miarolitic in pegmatite	3 (Hyd)
Janeczek, 1996	Poland	Pegmatite	6 (Peg)
Jensen (new BYU data)	Utah	Tertiary bentonite	50 (Vol)
Jiang & Palmer, 1996	British Columbia	Pb-Zn-Ag deposit	10 (Hyd)
Jiang et al., 2016	China	Granodiorite	17 (Plu)
Jiang et al., 2016	China	Diorite	23 (Plu)
Jung & Hellebrand, 2007	Namibia	Syenite	8 (Plu)
Kassoli-Fournaraki et al., 1995	Greece	Calc-silicate	5 (Met)
Kawachi et al., 1983	New Zealand	Schist	5 (Met)
Kay, 1983	Alaska	Meta quartz monzodiorite	2 (Met)
Khalil et al., 2016	Egypt	Meta-volcaniclastics	8 (Met)
Konzett & Hoinkes, 1996	Italy	Amphibolite	2 (Met)
Kowallis (new BYU data)	Montana	Pegmatite	2 (Peg)
Kowallis (new BYU data)	Ontario	Pegmatite	2 (Peg)
Kowallis (new BYU data)	Unknown	Unknown	3 (Met)

Kowallis (new BYU data)	Ontario	Fenitized metasediments	3 (Met)
Kowallis (new BYU data)	Utah	Cretaceous bentonite	4 (Vol)
Kowallis (new BYU data)	Utah	Granite, Jurassic	5 (Plu)
Kowallis (new BYU data)	Australia	Amphibolite dike	6 (Met)
Kowallis (new BYU data)	Ontario	Metamorphosed pegmatite	6 (Met)
Kowallis (new BYU data)	New York	Gneissic pegmatite	6 (Met)
Kowallis (new BYU data)	Australia	Hydrothermal veins	6 (Hyd)
Kowallis (new BYU data)	Utah	Granite, Cenozoic	6 (Plu)
Kowallis (new BYU data)	Nevada	Rhyolite Tuff	6 (Vol)
Kowallis (new BYU data)	Utah	Andesite lava	6 (Vol)
Kowallis (new BYU data)	Utah	Miarolitic cavities in aplite	46 (Hyd)
Kowallis (new BYU data)	Colorado	Cretaceous bentonite	10 (Vol)
Kowallis (new BYU data)	Utah	Precambrian biotite gneiss	13 (Met)
Kowallis (new BYU data)	Ontario	Fenitized alaskite & syenite	15 (Met)
Kowallis (new BYU data)	Utah	Granite laccolith, Tertiary	19 (Plu)
Kowallis (new BYU data)	Utah	Hydrothermal in granite	45 (Hyd)
Kowallis (new BYU data)	Utah	Dacite tuff	56 (Vol)
Kowallis (new BYU data)	Utah	Cenozoic granite near skarn	59 (Plu)
Kowallis (new BYU data)	Ontario	Alaskite granite	65 (Plu)
Kowallis (new BYU data)	California	Syenite, Jurassic	71 (Plu)
Kowallis (new BYU data)	California	Syenite, Jurassic	86 (Plu)
Kowallis (new BYU data)	California	Granite, Cretaceous	117 (Plu)
Kowallis (new BYU data)	Colorado	Dacite tuff	118 (Vol)
Kowallis (new BYU data)	Ontario	Fenitized gneiss	139 (Met)
Kowallis (new BYU data)	California	Granite, Jurassic	162 (Plu)
Kowallis (new BYU data)	California	Granite, Jurassic	185 (Plu)
Kowallis (new BYU data)	Nevada	Rhyolite tuff	203 (Vol)
Kowallis (new BYU data)	Nevada	Rhyolite tuff	407 (Vol)
Kowallis et al., 2001	Utah	Bentonites Middle Jurassic	204 (Vol)
Kretz, 2005	Quebec	Nepheline syenite	1 (SiU)
Krmíček et al., 2011	Czech Republic	Lamproitic dike	4 (Plu)
Laurent et al., 2017	South Africa	Granite and granodiorite	66 (Plu)
Lecuyer et al., 1995	Unknown	Unclassified metamorphic	2 (Met)
Liferovich & Mitchell, 2005	Russia	Hydrothermal veins	14 (Hyd)
Liu et al., 2018	China	Skarn	56 (Hyd)
Lopez Sanchez-Vizcaino, 1997	Spain	Calc-silicate	5 (Met)
Luhr et al., 1984	Mexico	Trachyandesite	1 (SiU)
Lussier et al., 2009	Norway	Pegmatite	2 (Peg)
Makanjuola and Howie, 1972	France	Blueschist	4 (Met)
Markl and Piazzolo, 1999	Antarctica	Calcsilicate	17 (Met)
Marsh and Kelly, 2017	Ontario	Metabasite	2 (Met)
McColl & Petersen, 1990	Australia	Hydrothermal	1 (Hyd)
McLeod et al., 2011	Scotland	Granite	10 (Plu)
McLeod et al., 2011	Scotland	Diorite dike	17 (Plu)
McLeod et al., 2011	Scotland	Diorite	22 (Plu)
McLeod et al., 2011	Scotland	Veined diorite	22 (Plu)
McLeod et al., 2011	Scotland	Granite-diorite hybrid	31 (Plu)
McLeod et al., 2011	Scotland	Vesicular diorite	48 (Plu)
Mevel, 1981	Vema Fracture Zone	Metabasalt	1 (Met)
Middleton et al., 2013	France	Monzogranite	2 (Plu)
Mikhailova et al., 2017	Russia	Peralkaline granite	1 (Plu)
Mohammad & Maekawa, 2008	Iraq	Metarodigite	22 (Met)
Moore & McStay, 1990	South Africa	Plag-qtz gneiss	1 (Met)
Morad, 1988	Norway	Authigenic in sandstones	12 (Hyd)
Morad et al., 1990	Sweden	Hydrothermal in granite	4 (Hyd)
Morgante, 1943	Unknown	Pegmatite	1 (Peg)
Mosher (new BYU data)	Utah	Mafic enclaves in granite	171 (Plu)
Mrazek and Vrana, 1984	Czechoslovakia	Pegmatite in skarn	1 (Peg)
Nakada, 1991	Andes Mountains	Dacite	7 (Vol)
Ng et al., 2016	Myanmar	Omphacitite & jadeite	11 (Met)
Nielsen, 1979	Greenland	Syenite	2 (Plu)
Nijland et al., 1993	Norway	Metabasite	1 (Met)
Nishiyama, 1990	Japan	Metabasite	2 (Met)
Oberti et al., 1991	Various	Eclogite, amphibolite	4 (Met)
Ogasawara et al., 2002	Kazakhstan	Marble	6 (Met)
Olin & Wolff, 2012	Canary Islands	Phonolite	2 (SiU)
Pan & Fleet, 1992	Ontario	Green-mica schist	10 (Met)
Pan & Fleet, 1996	Unknown	Granulite calc-silicate	1 (Met)
Pan et al., 1993	Brazil	Hydrothermal	1 (Hyd)
Pan et al., 1993	India	Pegmatite	2 (Peg)
Pan et al., 1993	Ontario	Pegmatite	2 (Peg)
Pan et al., 1993	Manitoba	Granite	2 (Plu)
Pan et al., 1993	Ontario	Pyroxenite	3 (Met)
Paslick et al., 1996	Tanzania	Foidite	6 (SiU)
Paterson & Stephens, 1992	Scotland	Granodiorite	14 (Plu)
Paterson et al., 1989	Scotland	Appinite	13 (Plu)
Paul et al., 1981	Unknown	Pegmatite	3 (Peg)
Pauly, 1948	Greenland	Skarn	2 (Met)

Pedersen, 1979	Greenland	Shale buchite xenolith	1 (Met)
Perseil & Smith, 1995	Italy	Quartzite (eclogite)	20 (Met)
Peterson, 1989	Kenya	Nephelinite lava	1 (SiU)
Piuzana et al., 2008	Brazil	Gneiss	10 (Met)
Pilmer, 1984	New South Wales	Skarn	1 (Hyd)
Radvenec, 1994	Slovakia	Metagranite	1 (Met)
René, 2008	Czech Republic	Metabasite	6 (Met)
René, 2010	Czech Republic	Secondary in granite	6 (Hyd)
Robinson et al., 2015	Tibet	Chromitite in ophiolite	4 (Met)
Rossetti et al., 2017	Turkey	Orthogneiss	8 (Met)
Rossetti et al., 2017	Turkey	Granodiorite	9 (Plu)
Russell et al., 1994	British Colombia	Metasomatised pegmatite	21 (Peg)
Sawka & Chappell, 1988	California	Granodiorite	4 (Plu)
Schiffman et al., 1985	Mexico	Authigenic	3 (Hyd)
Segvic et al., 2016	Croatia	Amphibolite	8 (Met)
Seifert, 2005	Germany	Secondary in lamprophyre	2 (Hyd)
Seifert et al., 2009	Germany	Secondary in granite	2 (Hyd)
Shau et al., 1991	Taiwan	Orthogneiss	3 (Met)
Shellnut and Iizuka, 2011	China	A-type granites	8 (Plu)
Smith et al., 2009	Sweden	Cu Au deposit	15 (Hyd)
Smith, 1970	Cameroon	Nephelinite lava	5 (SiU)
Sobolev and Shatsky, 1990	Russia	Biotite gneiss	1 (Met)
Stephenson & Cook, 1997	East Antarctica	Calc-silicate granulite	12 (Met)
Tararin et al., 2011	Russia	Schist	14 (Met)
Trzcinski et al., 1984	New Brunswick	Metabasite	1 (Met)
Tulloch, 1979	New Zealand	Metagranodiorite	2 (Met)
Uher et al., 1998	Slovakia	Pegmatite	5 (Peg)
Vakh et al., 2012	Russia	Metasomatized rocks	11 (Hyd)
van Marcke de Lummen, 1986	England	Skarn	1 (Hyd)
van Panhuys-Sigler & Trewin, 1990	Scotland	Authigenic in sandstones	6 (Hyd)
Viana da Cunha et al., 2016	Brazil	Precambrian metagranite	19 (Met)
Vogt & Flower, 1989	Malaysia	Hornblende quartz monzonite	2 (Plu)
Vuorinen and Hälenius, 2005	Sweden	Melteigite	3 (SiU)
Walters, 2016	Nepal	Metasediments, calc-silicates	22 (Met)
Wang et al., 2001	China	I-type granites	6 (Plu)
Wang et al., 2001	China	A-type granites	3 (Plu)
Winkel (new BYU data)	Arkansas	Nepheline Syenite	7 (SiU)
Winkel (new BYU data)	California	Tuff, Jurassic	8 (Vol)
Winkel (new BYU data)	California	Altered Tuff	16 (Hyd)
Winkel (new BYU data)	Arkansas	Ijolite Xenolith	17 (SiU)
Winkel (new BYU data)	Arkansas	Nepheline syenite	42 (SiU)
Winkel (new BYU data)	Ontario	Pegmatite in Gneiss	42 (Peg)
Winkel (new BYU data)	Arkansas	Jacupirangite	120 (SiU)
Winkel (new BYU data)	Germany	Phonolite Tuff	120 (SiU)
Winkel (new BYU data)	Macedonia	Pegmatite	160 (Peg)
Winkel (new BYU data)	Ontario	Fenitized Gneiss	229 (Met)
Wintsch and Yi, 2002	Connecticut	Gneiss	4 (Met)
Wolff, 1984	Canary Islands	Phonolite Lava	1 (SiU)
Woolley et al., 1992	Malawi	Nepheline syenite	4 (SiU)
Wu et al., 2016	China	Lujavrite and Nephelinite	105 (SiU)
Xie et al., 2006	China	A-type Granites	10 (Plu)
Xu et al., 2015	China	Barren Porphyry	6 (Plu)
Xu et al., 2015	China	Cu Porphyry	15 (Plu)
Yau et al., 1984	New Jersey	Marble	1 (Met)
Ye et al., 2002	China	Garnet clinopyroxenite	13 (Met)
Ying & Pu, 2005	Queensland	Albitized amphibolite	10 (Met)
Ying & Pu, 2005	Queensland	Granite and diorite	7 (Plu)
Zhang et al., 2016	Tibet	Amphibolite	6 (Met)
Zucali, 2011	Italy	Eclogite	2 (Met)

Note: Analysis types refer to the generic type of rock from which the titanites were extracted and include volcanic (Vol), plutonic (Plu), metamorphic (Met), silica-undersaturated (SiU), hydrothermal (Hyd), and pegmatitic (Peg).