Supplementary material to the article

Features of petrology of the Kurey graphite deposit in the roof of the trap intrusion of the First threshold (Siberian Platform)

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Electronic Annexes

Supplementay Data:

This file contains one abbreviation sheet, one supplementary figure of a map with a legend and five supplementary tables

LIST OF ABBREVIATIONS AND SYMBOLS USED

KG-XXX c measurements in the center of the mineral

KG-XXX e measurements at the edge of the mineral

- (dash) . no data

Σ - the amount

Wo - wollastonit

En - enstatite

Fs – ferrosilite

Fa – fayalite

Fo - forsterite

Ab – albit,

Ort – orthoclase]

An – anortit

LOI - loss on ignition

at. % atomic percentages

wt.%) weight percentages

f = 100Fe/(Fe+Mg) at. %.

Figure. Geological map of the location of the Kurey graphite deposit

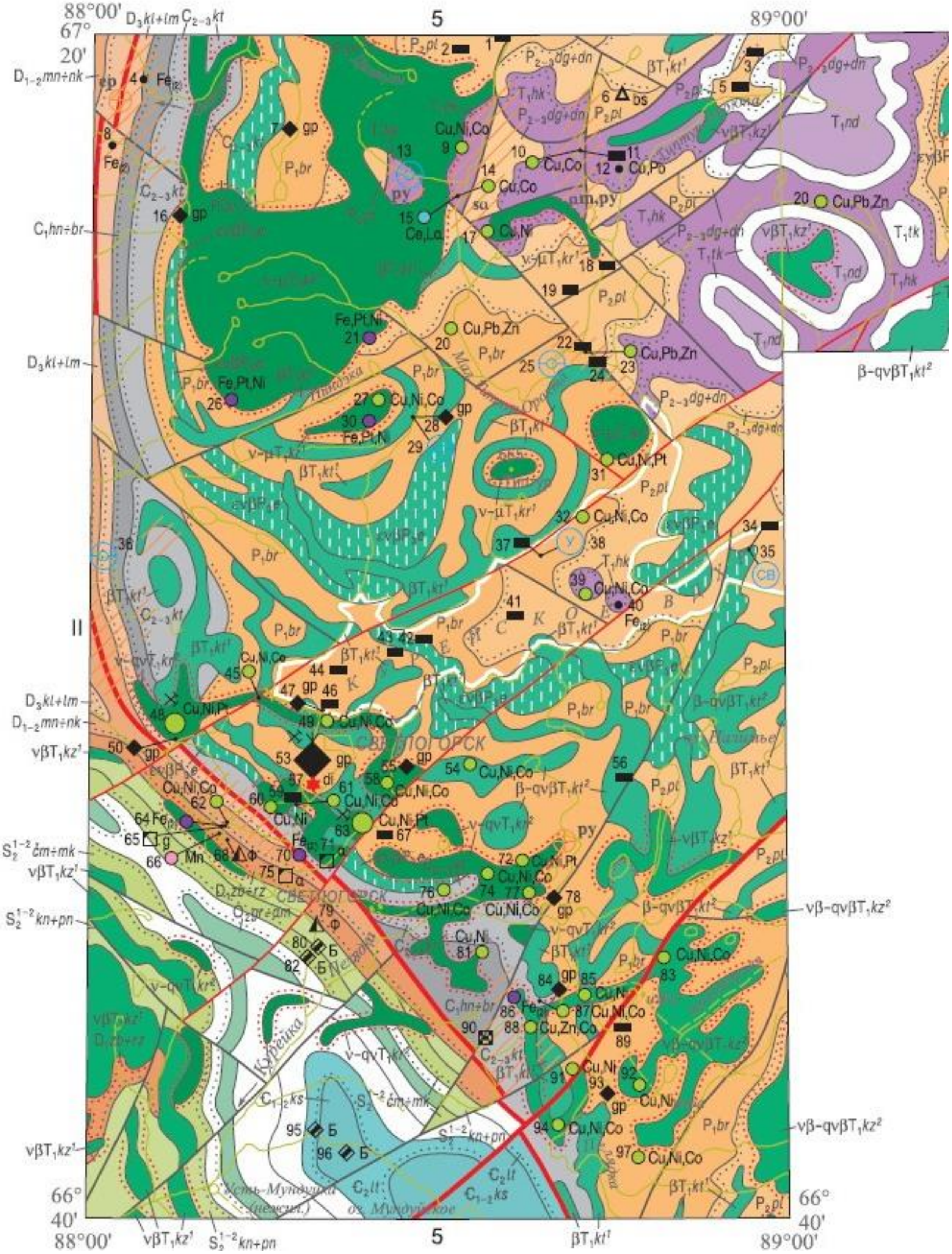

Figure. Geological map of the location of the Kurey graphite deposit (Варганов и др., 2018)

Legend to the map.

Kurean gabbro-dolerite hypabyssal complex. Differentiated formation bodies honoliths and dikes (ν-q$\nu T_1 kr^2$). Kuzminovsky gabbro-dolerite hypabyssal complex. Formation bodies honoliths and dikes ($\nu\delta$-q$\nu T_1 kr^2$).

Katanga gabbro-dolerite hypabyssal complex. Sills, stocks, dikes (β-q$\nu T_1 kr^2$)

Kostin's suite. Dolomites clay and calcareous cream gray silicilites limestones anhydrites ($Є_{1-2}$ *ks*). The Shumikhinsky suite. Clay limestones, dolomite raw materials ($Є_{1-2}$ *śm*).

The Ergalakh gabbro-dolerite complex is hypabyssal. Forces. Dykes. Gabbrodolerites are moderately alkaline, trachydolerites ($\varepsilon\nu\beta P_3$e)

The Burguklian formation. Sandstones, siltstones, mudstones, conglomerates, gravelites of light (P_1*br*)

Pelyatkin formation, Sandstones, siltstones, conglomerates, gravelites, coal seams with a capacity of up to 17,4 m (120-240 м), (P_2*br*).

Degalinskaya and Degensky formations, siltstones, carbonaceous siltstones, quartz sandstone interlayers, gravelite lenses, tuffite interlayers, tuffs, coal seams with a thickness of 9.1 m (P_{2-3} *dg+dn*).

Nadezhdinskaya formations. Plagioporphyre basalts, glomeroporphyre basalts, rarely aphyre basalts with interlayers and lenses of tuffs, tuffites, limestones (T_1*nd*).

Dvuroginskaya formations. Tuffs of the main composition, tuff conglomerates, tuff sandstones, basalts (T_1*tv*).

The Tuklon formation. Poikiloofite basalts, low-power tuffite interlayers (T_1*tk*). Syverminskaya retinue. Basalts are moderately alkaline, in the lower part flows of spherical lavas, low-power interlayers and lenses of tuff rocks (T_1*sv*).

Metasomatites:

Khanelbirinskaya, Serebryanskaya, Tundrinskaya, and Brussian formations. Limestones, siltstones, mudstones, carbonate breccias, clay limestones (C_1 *hn-br*).

The Kata formation. Sandstones, siltstones, mudstones, coal beds up to 1.35 m; at the base – carbonate nodules, limestone interlayers (C_{2-3} *kt*)

The main faults are reliable. (ore-centering discontinuities are shown in red).

The faults are secondary reliable.

Coal deposits.

Kurey graphite deposit.

Graphite deposits

Table S1. Chemical composition of minerals (**pyroxene, plagioclase, olivine, amphibole, muca, ilmenite, apatite, titannomagnetite**) of the rocks of the intrusion of the First threshold of the Kureika River (content in mass %)

Pyroxene

№ sample	SiO2	TiO2	Al2O3	FeO	MnO	MgO	CaO	Na2O	K2O	NiO	Cr2O3	Σ	Wo	En	Fs
KG-174 c	51.13	0.80	2.02	11.7	0.28	15.1	17.6	0.25	0.006	-	0.041	98.9	36	44	20
KG-174 e	51.20	0.77	1.52	14.0	0.33	13.8	17.1	0.25	0.003	-	0.024	99.0	36	41	23
KG-178 c	50.61	0.86	2.05	12.8	0.32	14.4	17.5	0.26	-0	-	0.009	98.8	36	42	22
KG-178 e	49.78	0.54	0.85	21.0	0.54	9.5	16.5	0.20	-	-	0.012	98.9	35	29	36
KG-179 c	50.09	0.69	1.03	19.8	0.51	12.0	14.6	0.21	0.005	-	0.004	98.9	31	35	34
KG-179 e	48.37	0.45	0.31	27.3	0.64	4.7	17.0	0.24	0.005	-	0.005	99.0	38	14	48
KG-180 c	50.52	0.88	1.76	16.3	0.41	15.2	13.6	0.17	0.005	-	0.015	98.8	29	44	27
KG-180 e	50.76	0.87	1.76	14.6	0.35	14.7	15.6	0.19	0.001	-	0.01	98.9	32	43	25
KG-180/1 c	50.62	0.92	2.29	12.9	0.33	14.5	17.0	0.26	-	-	0.018	98.9	35	43	22
KG-180/1 e	49.00	0.53	0.61	23.1	0.57	7.1	17.7	0.22	0.004	-	0.001	98.9	38	22	40
KG-181 c	52.18	0.74	-	27.2	0.63	17.4	2.0	-	-	0.018	0	100.1	4	51	45
KG-181 e	50.63	0.81	1.62	14.7	0.39	15.3	15.1	0.23	-	-	0.018	98.8	31	44	25
KG-181/2 c	51.30	0.78	1.50	13.9	0.39	15.2	15.9	0.26	-	-	0.01	99.1	33	43	24
KG-181/2 e	51.96	0.05	0.34	24.9	0.61	20.2	1.0	0.02	0.001	-	0.001	99.0	2	57	41
KG-181/3	51.51	0.22	0.37	24.3	0.59	17.1	4.7	0.06	0.006	-	0.012	98.9	10	49	41
KG-199 c	52.79	0.13	0.44	8.7	0.33	14.7	21.1	0.37	-	-	-	98.6	43	42	15
KG -199 e	51.65	0.27	0.39	13.7	0.39	12.9	19.1	0.41	0.003	-	-	98.8	39	38	23
KG-201 c	48.11	1.51	4.53	9.6	0.18	13.2	20.4	0.47	-	-	0.219	98.2	44	40	16
KG-201 e	49.37	1.15	3.38	10.0	0.22	13.5	20.5	0.47	-	-	0.059	98.6	43	40	17

Note: Wo+En+Fs = 100%

Plagioclase

№ sample	SiO2	Al2O3	FeO	MnO	MgO	CaO	BaO	Na2O	K2O	Σ	Ab	Ort	An
KG-174 c	54.45	28.01	0.61	0.01	0.13	10.9	0.01	5.13	0.24	99.54	45	2	53
RG-174 e	53.31	28.62	0.69	-	0.06	11.9	0.02	4.54	0.21	99.29	41	1	58
KG-178 c	55.27	27.15	0.59	0.01	0.08	10.4	0.05	5.45	0.27	99.28	48	1	51
KG-175e	62.67	22.78	0.29	0.02	0.01	4.75	0.1	8.37	0.70	99.67	73	4.	23
KG-178/1 c	66.37	18.59	0.63	0.01	0.07	0.4	0.1	6.14	9.41	101.7	49	49	2
KG-178/1 e	66.4	20.36	0.40	-	-	1.61	0.01	5.94	0.76	95.47	81	7	12
KG-179 c	54.93	27.49	0.65	0.01	0.09	10.7	0.04	5.28	0.24	99.48	46	2	52
KG-179 e	59.75	24.5	0.54	0.01	0.02	6.63	0.06	7.49	0.40	99.4	66	2	32
KG-179/1 c	68.1	17.96	0.65	0.01	-	0.03	0.09	5.32	4.74	96.9	63	37	0
KG-179/1 e	68.53	18.08	0.64	0.01	-	0.02	0.12	4.8	4.79	96.98	60	40	0
KG-180 c	55.35	27.37	0.67	0.01	0.1	10.4	0.04	5.53	0.19	99.63	49	1	50
KG-180 e	56.53	26.46	0.53	0.01	0.07	9.36	0.04	6.01	0.30	99.32	53	2	45
KG-180/1 c	54.99	27.6	0.66	0.01	0.1	10.6	0.04	5.12	0.23	99.38	46	1	53
KG-180/1 e	60.06	15.94	6.70	0.06	1.45	0.61	0.02	1.1	11.26	97.19	12	84	4
KG-180/2 c	65.83	21.27	0.34	0.01	-	2.84	0.03	9.44	0.70	100.5	82	4	14
KG-180/2 e	61.32	15.57	8.19	0.04	1.16	0.63	0.01	1.21	10.72	98.84	14	8	4
KG-181	48.02	32.28	0.60	-	0.03	15.6	0.02	2.47	0.09	99.12	22	1	77
KG-201	62.96	23.05	0.50	0.01	0.02	5.04	0.05	7.7	0.38	99.72	72	2	26
KG-199	56.24	26.62	0.89	-	0.07	9.44	0.05	5.65	0.19	99.15	51	1	48

Note: Ab+Ort+An = 100%

Olivine

№ sample	SiO2	TiO2	FeO	MnO	MgO	CaO	NiO	Cr2O3	Σ	Fo	Fa
KG-181	34.29	0.049	43.65	0.61	20.57	0.10	0.039	0.007	99.32	46	54
KG-181/1	33.65	0.075	45.74	0.60	18.94	0.15	0.057	-	99.21	42	58
KG-181/2	33.41	0.105	46.48	0.59	18.26	0.11	0.047	-	99.01	42	59

Note: Fo+Fa = 100%

Amphibole

№ sample	SiO2	TiO2	Al2O3	FeO	MnO	MgO	CaO	Na2O	K2O	Cr2O3	F	Cl	Σ	H2O	*f*
KG-178	42.39	0	5.59	32.18	0.40	2.26	10.12	0.46	1.22	-	0.50	2.04	97.2	1.03	89
KG -180	44.95	1.3	5.39	23.45	0.22	8.31	9.98	0.93	0.74	-	1.24	0.53	97.0	1.17	61
KG-180/1	47.18	0.147	2.82	31.35	0.31	4.88	8.96	0.26	0.49	-	0.48	1.15	98.0	1.35	78
KG-201	45.21	0.554	6.92	21.05	0.33	8.37	10.51	0.63	0.36	0.002	0.42	1.31	95.8	1.37	59
KG-201/1	50.1	0.095	3.44	18.14	0.29	12.41	10.51	0.27	0.17	0.037	0.33	0.37	96.2	1.73	45
KG-199	53.17	0.229	1.26	15.48	0.30	13.69	11.16	0.02	0.02	0.002	0.25	0.096	95.7	1.87	39

Mica

№ sample	SiO2	TiO2	Al2O3	FeO	MnO	MgO	CaO	Na2O	K2O	Cr2O3	F	Cl	Σ	H2O	O=F,Cl	*f*
KG-201	39.1	2.12	12.8	12.3	0.04	17.27	0.026	0.072	8.64	0.014	1.09	0.91	94.3	3.22	0.67	28.5
RG-199	37.8	2.37	12.2	14.7	0.06	15.86	0.015	0.029	8.94	0.019	0.80	1.54	94.2	3.10	0.69	34.1
KG-191	36.9	4.37	11.5	18.1	0.04	12.51	0.018	0.001	9.02	-	0.86	0.43	93.7	3.30	0.46	44.8
KG-191/1	36.5	4.56	12.5	17.4	0.04	13.37	0.019	0.1	8.02	-	0.87	0.42	93.7	3.33	0.46	42.2
KG-180	34.3	0.38	10.2	33.7	0.14	3.26	0.034	-	8.65	-	0.59	4.33	95.6	2.05	1.23	85.3
KG-180/1	34.8	1.10	10.4	34.3	0.08	4.34	0.01	0.053	8.47	-	0.54	3.02	97.1	2.53	0.91	81.6
KG-179	34.4	0.99	9.8	35.8	0.18	2.94	0.082	0.15	8.37	0.009	0.58	3.17	96.4	2.40	0.96	87.2
KG-178	33.8	0.45	10.4	36.4	0.10	2.97	0.005	0.031	8.5	-	0.56	3.71	96.9	2.25	1.07	87.3
KG-178/1	33.8	0.99	10.5	36.2	0.18	2.4	0.015	-	8.51	0.024	0.57	3.52	96.7	2.29	1.03	89.4
KG-174	38.5	4.42	12	16.3	0.04	14.33	0.097	0.097	8.84	0.038	1.42	0.37	96.4	3.20	0.68	38.9

Apatite

№ sample	SiO2	FeO	MnO	CaO	CeO2	P2O5	F	Cl	H2O	O,mas%	Σ
KG-178	0.11	0.21	0.06	54.52	0.09	41.31	1.97	0.37	2.35	0.91	100.08
KG-179	0.15	0.39	0.09	53.73	0.16	41.34	2.39	0.13	2.20	1.04	99.53
KG-179/1	0.11	0.51	0.10	53.61	0.08	40.96	2.29	0.53	2.12	1.08	99.21
KG-180	0.24	0.41	0.04	53.91	0.26	41.26	2.00	0.22	2.36	0.89	99.81
KG-18/10	0.10	0.44	0.08	54.13	0.02	41.11	2.04	0.54	2.25	0.98	99.73

Ilmenite

№ sample.	TiO2	Al2O3	FeO	MnO	MgO	NiO	Cr2O3	V2O5	Σ	Fe2O3	FeO*
KG-377	51.7	-	41.77	6.50	0.49	-	0.069	0.238	100.7	3.06	39.02
KG-377/1	51.7	0.025	43.08	6.72	0.14	-	0.064	0.31	102.0	4.07	39.42
KG-191	50.7	0.033	45.68	0.59	1.75	0.041	0.006	0.003	98.8	4.28	41.83
KG-180	51.4	-	46.58	1.01	0.12	0.008	0.01	0.142	99.2	1.82	44.94
KG-179	49.9	-	48.03	0.65	0.15	0.002	0.006	-	98.7	4.54	43.94
KG-178	50.3	0.008	48.11	0.68	0.40	0.004	-	-	99.5	4.71	43.87
KG-174	50.2	0.012	47.61	0.54	0.60	0.006	0.009	-	98.9	4.56	43.50

Titanomagnetite

№ sample	TiO2	Al2O3	FeO	MnO	MgO	NiO	Cr2O3	V2O5	Σ	Fe2O3*	FeO*
KG-174	19.68	0.807	72.64	0.548	0.096	0.023	0.132	0.99	94.91	27.6763	47.73656
KG-179	11.31	0.148	81.69	0.281	0.042	0.013	0.019	0.555	94.05	45.64167	40.62113
KG-181	9.73	2.72	80.06	0.289	0.674	0.087	0.08	1.6	95.23	46.06912	38.6065
KG-199	7.95	1.43	81.07	0.434	0.36	0.042	0.112	0.633	92.02	49.51408	36.51669
KG-199/1	8.99	1.01	83.15	0.454	0.062	0.058	0.075	0.622	94.42	49.53411	38.57867

Table S2 The composition of sulfides from the rocks of the intrusion of the First threshold of the Kureiki river (content in wt.%)

№ sample	mineral	Fe	Co	Ni	Cu	S	Σ	№ sample	mineral	Fe	Co	Ni	Cu	S	Σ
KG-199	Chalcopyrite	30.3	0.03	-	34.6	35.1	99.9	KG-180	Pirrhotite	55.6	3.96	4.1	0.7	36.1	100.4
KG-199	Pyrite	46.7	0.04	-	-	52.7	99.4	KG-180	Pirrhotite	60.8	0.078	0.03	0.0	39.5	100.4
KG-181	Cubanit	40.4	0.04	0.01	23.0	35.1	98.5	KG-180	Chalcopyrite	29.7	0.026	-	34.3	34.6	98.4
KG-181	Chalcopyrite+ +pyrrhotite	30.8	0.66	4.14	29.9	34.5	100.1	KG-179	Chalcopyrite+ +pyrrhotite	44.7	0.38	2.06	17.2	36.5	100.9
KG-181	Pirrhotite	61.7	0.06	0.15	0.02	38.9	101.8	KG-178	Cubanit	40.9	0.026	-	23.5	35.2	99.4
KG-181	Pirrhotite	35.1	4.01	26.8	0.05	33.3	99.2	KG-178	Chalcopyrite	29.9	0.013	-	34.4	34.8	99.1
KG-181	Chalcopyrite	34.1	0.08	0.73	31.4	35.1	100.7	KG-174	Pirrhotite	60.6	0.068	0.12	0.0	39.4	100.2
KG-179	Chalcopyrite	31.0	0.05	-	34.3	35	100.3	KG-174	Chalcopyrite	29.5	0.017	-	34.0	34.8	98.4
KG-179	Chalcopyrite	61.1	0.14	0.17	0.021	39.7	101.1	KG-174	Chalcopyrite	29.7	0.012	-	33.9	35.0	98.6

Table S3. Chemical composition of minerals (**pyroxene, plagioclase, amphibole, mica, thomsonite, analcime, ilmenite, magnetite, sphen, rutile**) of microdolerite injections in the graphite formation of the Kureysky mine. Content in mas. %.

Pyroxene

№ Обр.	SiO2	TiO2	Al2O3	FeO	MnO	MgO	CaO	BaO	Na2O	K2O	Cr2O3	Σ	Wo	En	Fs
КГ-300	46.5	2.82	5.14	11.37	0.22	10.62	20.48	-	0.44	0.003	0.115	97.7	46	33	20
КГ-300-1	52.8	0.57	1.04	9.44	0.26	13.74	21.15	-	0.23	-	0.019	99.3	44	40	16
КГ-301	53.1	0.92	2.03	4.68	0.10	14.57	24.15	-	0.29	-	0.047	99.8	50	42	8
КГ-301-1	51.7	0.60	2.01	9.77	0.24	13.07	21.02	-	0.31	-	0.011	98.7	45	39	17
КГ-305	52.3	1.20	2.33	3.15	0.07	15.52	23.92	-	0.25	-	0.004	98.7	50	45	5
КГ-305-1	48.4	3.34	6.01	2.65	0.08	14.17	23.92	-	0.16	-	0.023	98.8	52	43	5
КГ-306/1	54.7	-	1.11	0.46	0.09	17.83	25.39	0.02	0.48	0.005		100.1	50	49	1
КГ-306/1-1	52.6	0.63	1.30	4.96	0.16	15.50	22.82	-	0.28	-	0.009	98.2	47	45	8
КГ-306/1-2	54.2	0.85	1.20	1.43	0.05	17.46	23.76	-	0.26	-	0.033	99.3	48	49	2
КГ-306/2	53.4	0.53	1.13	4.89	0.16	15.33	22.96	-	0.29	-	0.065	98.7	48	44	8
КГ-306/3	54.8	0.26	0.90	3.03	0.14	16.22	24.08	-	0.33	-	0.032	99.7	49	46	5
КГ-310	53.3	0.29	0.69	6.73	0.20	15.48	21.62	-	0.27	0.002	0.096	98.7	45	44	11
КГ-310-1	53.6	0.25	0.74	5.33	0.17	15.71	22.55	-	0.28	0.026	0.063	98.7	46	45	9
КГ-310-2	55.8	0.23	1.83	4.64	0.19	15.18	21.59	-	0.16	0.592	0.082	100.3	46	45	8
КГ-311	53.0	0.87	1.96	4.20	0.17	15.73	22.88	-	0.24	-	0.002	99.1	47	45	7
КГ-371	54.2	0.45	0.71	3.41	0.10	17.19	22.78	-	0.20	-	0.034	99.1	46	48	6
КГ-371-1	53.4	0.29	0.75	5.96	0.18	15.60	22.26	-	0.17	0.005	0.184	98.8	46	45	10
КГ-331	52.5	-	1.55	6.61	0.13	14.42	22.45	0.06	0.31	0.031	-	98.1	47	42	11
КГ-331-1	53.9	-	0.98	0.49	0.12	12.80	25.47	0.12	0.37	0.034	-	94.3	58	41	1
КГ-331-2	53.3	0.19	0.96	8.57	0.15	13.73	21.80	-	0.27	0.021	0.051	99.1	46	40	14

Note: Wo+En+Fs = 100%

Plagioclase

№ sample.	SiO2	Al2O3	FeO	MnO	MgO	CaO	BaO	SrO	Na2O	K2O	Σ	Ab	Ort	An
KG-300	53.63	28.96	0.165	0.003	0.069	11.7	0.012	-	5.02	0.046	99.62	44	0	56
KG-300/1	55.12	28.09	0.246	-	0.047	10.61	0.006	-	5.44	0.071	99.63	48	0	52
KG-300/2	53.12	28.63	0.17	0.015	0.032	9.93	0.012	0.004	4.44	0.246	96.6	44	2	54
KG-300/3	55.15	27.96	0.194	-	0.022	10.19	0.024	-	5.62	0.116	99.28	50	1	50
KG-301	50.63	30.94	0.266	-	0.144	14.06	0.01	-	3.57	0.018	99.64	31	0	68
KG-301/1	51.29	30.73	0.086	0.016	0.025	13.56	0.012	-	3.66	0.057	99.44	33	0	67
KG-305	45.74	34.51	0.11	0.008	0.016	17.9	0.007	-	1.3	0.02	99.6	12	0	88
KG-306/1	53.15	29.71	0.139	-	0.1	12.66	0	-	4.5	0.08	100.34	39	0	61
KG-306/2	53.49	29.79	0.049	-	0.044	12.3	0.002	0.017	4.55	0.05	100.28	40	0	60
KG-306/3	54.95	28.2	0.124	-	0.021	10.31	0.002	-	5.56	0.113	99.28	49	1	50
KG-310/1	55.73	30.49	0.515	0.057	0.126	2.91		-	10.49	0.13	100.51	86	1	13
KG-310/2	56.64	27.19	0.068	0.009	0.009	9.1	0.024	-	3.57	0.141	96.76	41	1	58
KG-310/3	55.11	27.67	0.042	0.019	0.013	9.71	0.035	-	5.8	0.102	98.5	52	1	48
KG-310/4	56.55	27.47	0.07	0.008	0.009	9.25	0.022	-	4.71	0.146	98.23	47	1	52
KG-310/5	54.15	28.39	0.071	0.016	0.007	10.74	0.012	-	5.12	0.081	98.58	46	0	53
КГ-310/6	66.71	19.35	0.078	0.016	0	1.78	0.224	-	0.97	10.43	99.55	11	78	11
KG-311	50.57	30.7	0.55	0.007	0.029	13.66	0	-	3.81	0.073	99.39	33	0	66
KG-331	60.58	17.22	0.043	0.03	0.007	5.13	1.83	0.199	0.1	13.11	98.26	1	75	25
KG-371	52.48	29.22	0.727	0.101	0.267	11.81	0.019	-	4.39	0.099	99.12	40	1	59

Note: Ab+Ort+An = 100%

Amphibole

№ Обр.	SiO2	TiO2	Al2O3	FeO	MnO	MgO	CaO	Na2O	K2O	NiO	Cr2O3	F	Cl	Σ	H2O	Σ	*f*
КГ-310	41.9	5.76	13.06	2.44	0.05	17.62	12.00	3.47	0.24	-	0.04	-	-	96.6	2.1	98.65	7.21
КГ-310/1	42.3	6.14	11.44	2.21	0.03	18.43	11.71	3.77	0.25	-	0.02	-	-	96.3	2.1	98.42	6.30
КГ-310/2	42.0	5.81	11.72	2.53	0.03	17.82	11.85	3.62	0.27	-	0.04	-	-	95.7	2.1	97.78	7.38
КГ-310/3	42.0	6.00	12.70	2.50	0.02	17.69	11.88	3.17	0.25	0.01	0.00	1.39	0.12	97.7	1.4	99.08	7.35

Thomsonite

№ sample	SiO2	Al2O3	FeO	MnO	MgO	CaO	SrO	Na2O	K2O	Σ	H2O	Σ
КГ-301	36.87	31.86	0.046	-	0.036	12.32	1.29	3.57	0.015	85.9	13.2	99.1
КГ-305	37.1	32.35	0.017	-	0.015	12.40	0.847	3.6	0.006	86.3	13.3	99.79
КГ-305	36.9	32.4	0.012	-	0.019	12.61	0.68	3.52	0.006	86.2	13.3	99.51
КГ-371	41.0	32.7	0.069	-	0.021	12.13	0.776	2.17	0.003	88.9	13.9	102.8
КГ-331	38.8	30.36	0.023	-	0.027	11.58	1.13	2.72	0.014	84.7	13.2	97.9
КГ-331/1	40.7	30.11	0.019	0.001	0.012	11.58	0.371	4.02	0.012	86.9	13.6	100.5

Analcime

№ sample	SiO2	Al2O3	FeO	MnO	MgO	CaO	Na2O	K2O	Σ	H2O
KG-301	57.17	25.43	0.029	-	0.061	0.44	8.76	0.011	91.9	8.41
KG-301	53.16	25.35	0.165	-	0.04	0.49	9.5	0.023	88.73	8.04
KG-301	54.16	26.99	0.052	0.005	0.022	5.22	3.34	0.023	89.81	8.24
KG-306/1	56.27	23.8	-	0.005	0.013	0.07	12.64	0.029	92.84	8.34
KG 331	56.56	23.54	0.067	0.012	0.202	0.39	10.92	0.069	91.75	8.30

Mica

№ sample	SiO2	TiO2	Al2O3	FeO	MnO	MgO	CaO	BaO	SrO	Na2O	K2O	Cr2O3	Σ	H2O
KG-301	46.91	-	37.06	0.48	0.014	1.41	0.42	0.046	0	0.117	8.83	-	95.3	4.58
KG-301/1	47.92	-	34.38	2.15	0.005	1.18	0.39	0.039	0	0.06	9.36	-	95.48	4.54
KG-301/2	48.3	0.009	33	2.36	0.03	1.26	0.17	-	-	0.031	8.29	0.003	93.45	4.47

Ilmenite

№ sample	TiO2	Al2O3	FeO	MnO	MgO	Cr2O3	V2O5	Σ	Fe2O3*	FeO*
KG-310N	50.95	0.019	35.8	15.24	0.135	-	0.19	102.3	6.28	30.15
KG-377	51.67	-	41.77	6.5	0.49	0.069	0.24	100.7	3.06	39.02
KG-377/1	51.66	0.025	43.08	6.72	0.135	0.064	0.31	102.0	4.07	39.42

Magnetite

№ sample	TiO2	Al2O3	FeO	MnO	MgO	NiO	Cr2O3	V2O5	Σ
KG-310N	1.45	6.65	81.09	0.19	0.299	0.003	0.319	0.01	90.01
KG-370	2.08	5.59	79.82	0.479	0.56	0.007	0.833	-	89.37

Sphen

№ sample	SiO2	TiO2	Al2O3	FeO	MgO	CaO	Na2O	K2O	Cr2O3
KG-301	29.04	41.24	1.04	0.199	0.048	27.12	0.038	0	0
KG -301/1	29.44	42.03	1.13	0.123	0.043	27.17	0.038	0.012	0
KG -305	29.59	41.69	1.53	0.025	0.026	27.36	0.024	0	0
KG -306/1	29.79	42.46	1.49	0.139	0.074	27.49	0.041	0.002	0
KG -306/2	29.38	41.35	1.53	0.029	0.075	27.3	0.051	0	0
KG -306/3	29.72	41.12	1.74	0.096	0.084	27.61	0.051	0	0
KG -310	29.64	39.56	1.25	0.127	0.088	27.37	0.048	0.002	0.41
KG -371	29.39	41.64	1.47	0.073	0.092	27.3	0.06	0	0.13

Rutile

№ sample	TiO2	Al2O3	FeO	MgO	Cr2O3	V2O5	Σ
KG-310N	93.4	0.29	2.97	0.083	0.053	0.007	96.8
KG-310N/1	94.43	0.255	1.2	0.11	-	0.172	96.17
KG-386	101.26	0.046	0.024	-	0.358	0.059	101.75
KG-386/1	100.96	0.065	0.15	0.001	0.415	-	101.6

Table S4. Chemical composition of injections of microdolerites and intrusion rocks of the First threshold of the Kureika River. Content in mas.%.

№ sample	SiO2	TiO2	Al2O3	Fe2O3	MnO	MgO	CaO	Na2O	K2O	P2O5	LOI	Σ	Ba	H2O	S_{total}
KG-300	48.70	1.37	15.12	7.76	0.20	7.57	11.73	2.97	0.84	0.11	3.7	100.0	-	-	-
KG-301	47.00	1.27	14.88	4.12	0.16	8.11	17.51	2.02	0.12	0.17	4.7	100.0	-	-	-
KG-303	48.90	1.22	14.72	4.43	0.18	7.58	16.11	2.72	0.39	0.17	3.6	100.1	-	-	-
KG-304	48.68	1.34	15.48	4.32	0.17	7.67	13.80	3.67	0.31	0.21	4.2	99.86	-	-	-
KG-305	45.80	1.25	13.59	6.07	0.17	8.61	15.40	1.56	0.94	0.15	6.4	100.0	-	-	-
KG-307	48.81	1.39	14.47	7.27	0.18	7.54	12.77	2.17	1.85	0.14	3.4	100.0	-	-	-
KG-309	50.29	1.45	15.01	5.20	0.19	7.98	10.36	2.80	1.65	0.15	5.1	100.2	-	-	-
KG-312	49.05	1.39	14.43	4.17	0.17	7.33	13.32	1.88	1.95	0.10	6.4	100.2	-	-	-
KG-317	46.22	1.31	13.55	5.96	0.18	8.01	15.91	2.57	0.62	0.17	5.5	100.1	-	-	-
KG-318	50.44	1.36	14.95	4.69	0.17	7.11	14.73	2.99	0.44	0.12	3.0	100.0	-	-	-
KG-334	46.04	1.37	14.12	8.94	0.22	7.32	10.59	0.74	3.31	0.13	7.2	100.0	-	-	-
KG-384	50.67	1.46	15.34	4.72	0.21	8.17	11.84	2.62	1.06	0.11	3.8	100.0	-	-	-
KG-199/1m	47.84	1.40	14.67	13.62	0.22	7.33	10.59	2.54	0.38	0.12	1.2	-	0.024	-	-
KG-201sh	48.52	1.39	14.84	13.39	0.19	6.82	9.8	3.38	0.43	0.12	1	-	0.024	-	-
KG-181	49.57	1.15	15.2	12.58	0.20	7.54	11.24	1.74	0.43	0.11	0.2	-	0.019	-	-
KG-180	52.79	2.03	12.04	15.80	0.26	3.83	8.79	1.99	1.08	0.29	0.3	-	0.042	-	-
KG-179	51.84	2.39	12.32	15.69	0.25	3.95	9.4	2.78	0.76	0.24	0.01	-	0.041	-	-
KG-178	50.4	2.51	11.83	15.88	0.25	3.98	9.94	3.08	0.69	0.31	0.6	-	0.034	-	-
KG-176	50.9	2.13	12.34	17.09	0.27	3.91	8.86	2.6	0.88	0.23	0.1	-	0.042	-	-
KG-174	50.75	1.61	12.68	13.74	0.24	5.91	11.29	2.55	0.66	0.18	0.2	-	0.028	-	-
ПП-1	48.5	1.57	15.5	12.59	0.22	6.9	10.37	3.12	0.45	0.02	2.0	100.5	-	1.47	0.33
ПП-2	48.18	3.31	11.27	20.59	0.32	4.6	8.17	2.54	1.07	0.16	1.4	100.1	-	0.53	0.12
ПП-3	48.34	1.44	15.52	14.69	0.30	7.32	10.83	2.1	0.5	0.02	0.7	1010.0	-	0.36	0.09
ПП-4	50.15	1.83	13.09	13.21	0.24	7.41	12.44	2.1	0.65	0.02	0.5	101.1	-	0.47	0.02
ПП-5	48.18	1.28	15.36	13.41	0.32	7.86	10.38	2.52	0.6	0.09	1.09	100.64	--	0.5	0.05
KG-197	48.71	1.03	15.14	11.43	0.18	8.51	11.99	1.98	0.32	0.08	0.79	-	-	-	-
KG-195	48.75	1.02	15.27	11.13	0.17	8.58	11.93	1.46	0.3	0.08	0.93	-	-	-	-
КГ-194	48.71	0.98	15.35	11.10	0.21	8.85	11.77	1.67	0.31	0.08	0.65	-	-	-	-

Notation: Samples from KG-300 to KG-384 - injections of microdolerites;; KG-199m and KG-201sh -globular microdolerite (KG-199m matrix, KG-201w - globule); KG-181 - microdolerite of the endocontact zone of intrusion; KG-180 - gabbro-pegmatite, schlier; from

KG-179 to KG-176 - pegmatoid gabbro dolerite; KG -174 - polyvinic poikiloofite coarse - powdered dolerite; From PP-1 to PP-5, and KG-197; KG-195, KG-194 - olivine - containing gabbro dolerite. КГ -174 - безоливиновый пойкилоофитовый крупногорошчатый долерит

Table S5. Isotopic composition of carbon and oxygen in graphites and calcitites of the Kureysky mine.

№ sample	Sampling location, mineral	organic carbon	inorganic carbon	
		δ $^{13}CV_{PDB}$ (‰)	δ $^{13}C_{VPDB}$ (‰)	δ $^{18}O_{VSMOW}$ (‰)
KG-356	15 m from the sole of the formation: ″parquet″-Like graphite with cracks	--24.5		
	graphite from the crack surfac	-24.5		
	graphite + calcite + pyrite (by secant cracks and separately)	-25.5	-17.8	14.5
KG-182	9 m from the sole of the formation	-24.6		
KG-183	8 m from the sole of the formation	-24.2		
KG-184	7 m from the sole of the formation	-25		
KG-185	6 m from the sole of the formation	-24.2		
KG-186	5 m from the sole of the formation	-24		
KG-187	4 m from the sole of the formation	-24		
KG-188	3 m from the sole of the formation	-23.5		
KG-189	1 m from the sole of the formation	-24.7		
KG-191	Calcite from the upper border of calcitite		-23,5	12,4
KG-192	Calcite from the lower border of calcitite		-22,5	15,1
KG-387-1	icelandic spar		-17.4	8.7
KG-387-2	miarola		-11.4	7.1
KG-387-3	icelandic spar		-16.8	8.9
KG-387-4	white calcite		-15.2	16.2
KG-387-5	white calcite		-13.7	18.6

Continuation of table S5

№ sample	Sampling location, mineral	organic carbon	inorganic carbon	
		δ $^{13}CV_{PDB}$ (‰)	δ $^{13}C_{VPDB}$ (‰)	δ $^{18}O_{VSMOW}$ (‰)
KG-387-6	icelandic spar		-21.7	11.3
KG-387-7	miarola		-16.7	10
KG-387-8	icelandic spar		-15.7	9.9
KG-387-9	icelandic spar		-20.3	10.8
KG-387-10	icelandic spar		-14.1	16.2
KG-387-11	white calcite		-11.8	9.8
KG-387-12	white calcite		-14	9.4
KG-387-13	icelandic spar		-21.2	11.5
KG-387-14	white calcite		-13.1	13.3
KG-387-15	icelandic spar		-17.4	9.2

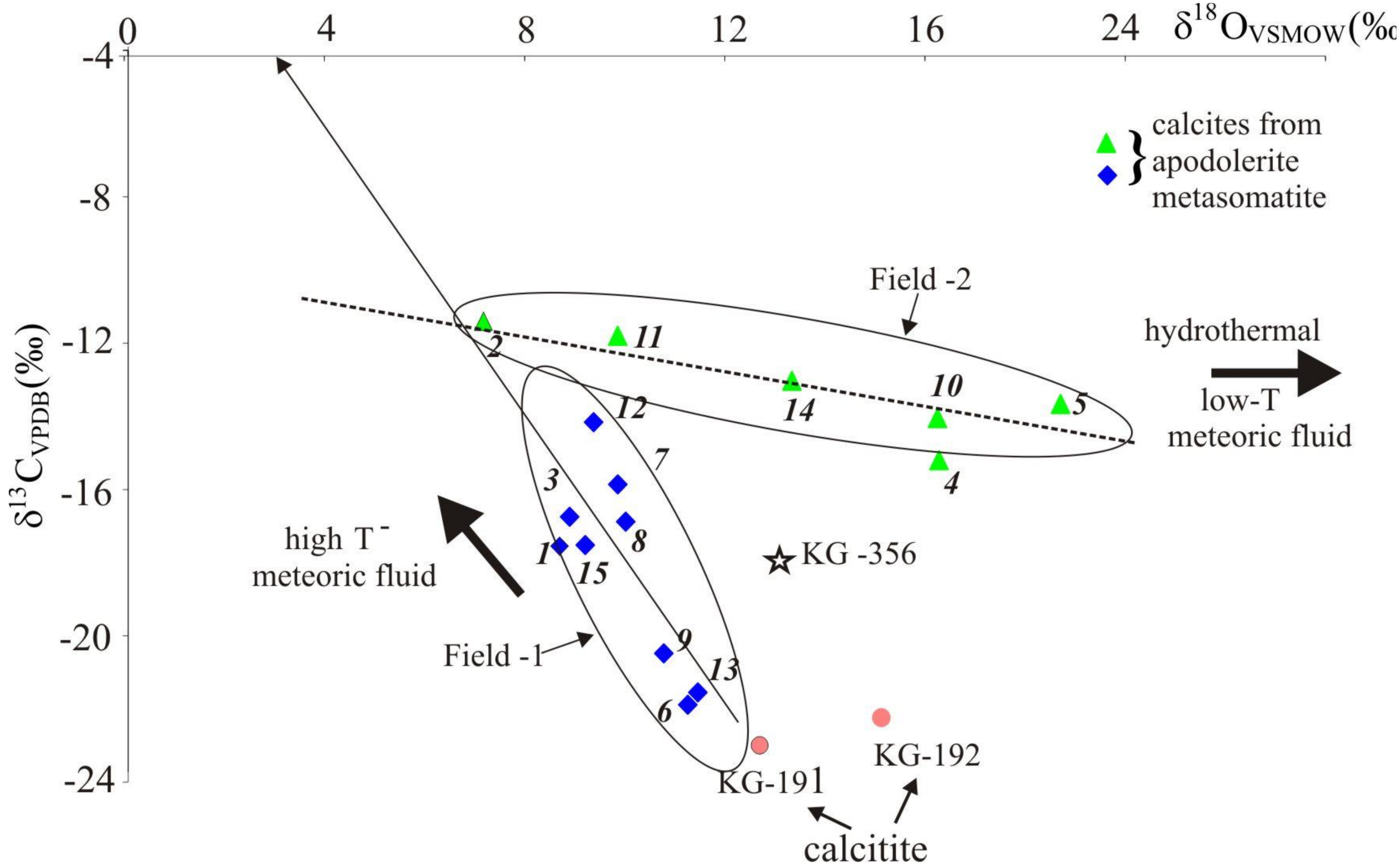

Рис. S2. Binary $\delta^{13}C$ and $\delta^{18}O$ calcite diagram of Kurey graphite deposit. Field 1: regression equations У = -2,1*X + 2,7. correlation coefficient – 0.79. Field 2: regression equations У = - 0,28*X – 9,4. correlation coefficient – 0.85. . The point numbers correspond to the data in the table S5. Large black arrows show the direction of evolution of calcite isotopic compositions in interaction with fluids (in accordance with the models presented in the works http://dx.doi.org/10.1016/j.chemgeo.2016.07.023, http://dx.doi.org/10.1016/j.chemgeo.2014.03.003, doi:10.1016/j.chemgeo.2007.05.002, Geochimica et Cosmochimica Acta, Vol. 59, No. 7, pp. 1339-1352, 1995)/