

Supplementary 1: ESM_1. Химические составы основных породообразующих минералов метагаббро-долеритов центра Карской астроблемы, мас. %

Na	Mg	Al	Si	K	Ca	Ti	V	Cr	Mn	Fe	Ba	Сумма	Эмпирическая формула
Кварцевый метагаббро-долерит													
<i>Калиевый полевой шпат. Ортоклаз</i>													
0.13	—	18.88	63.76	16.12	—	—	—	—	—	0.39	0.82	100.09	(K _{0.96} Na _{0.01} Ba _{0.02}) _{0.99} (Al _{1.04} Fe _{0.01}) _{1.05} Si _{2.97} O ₈
0.17	—	18.56	64.12	16.23	—	—	—	—	—	0.30	0.51	99.88	(K _{0.96} Na _{0.02} Ba _{0.01}) _{0.99} (Al _{1.02} Fe _{0.01}) _{1.03} Si _{2.98} O ₈
0.13	—	18.76	64.69	16.15	—	—	—	—	—	—	0.59	100.33	(K _{0.96} Na _{0.01} Ba _{0.01}) _{0.98} Al _{1.02} Si ₃ O ₈
<i>Эпидот</i>													
—	—	27.48	39.03	—	24.3	—	—	—	0.23	8.53	—	99.56	Ca _{2.00} (Fe _{0.49} Al _{2.49} Mn _{0.02}) _{3.00} (Si _{3.00} O ₈)
—	—	26.92	38.68	—	24.20	—	0.55	—	—	8.65	—	99.02	Ca _{2.01} (Fe _{0.51} Al _{2.46} V _{0.03}) _{3.00} (Si _{2.99} O ₈)
—	—	25.09	38.66	—	23.20	—	—	—	0.34	11.09	—	98.41	Ca _{1.95} (Fe _{0.66} Al _{2.32} Mn _{0.04}) _{3.02} (Si _{3.03} O ₈)
—	—	26.70	38.36	—	23.60	—	0.21	—	—	8.23	—	97.10	Ca _{1.99} (Fe _{0.49} Al _{2.49} V _{0.01}) _{2.99} (Si _{3.02} O ₈)
—	—	27.34	39.82	—	21.78	—	—	—	—	8.93	—	97.88	Ca _{1.81} (Fe _{0.51} Al _{2.50}) _{3.01} (Si _{3.08} O ₈)
—	—	27.06	37.95	—	23.80	—	0.21	—	—	8.11	—	97.16	Ca _{2.01} (Fe _{0.48} Al _{2.51} V _{0.01}) _{3.00} (Si _{2.99} O ₈)
—	—	27.21	38.14	—	24.10	—	—	—	—	7.85	—	97.30	Ca _{2.02} (Fe _{0.46} Al _{2.52}) _{2.98} (Si _{3.00} O ₈)
—	—	26.35	38.54	—	23.60	—	—	—	—	8.69	—	97.19	Ca _{2.00} (Fe _{0.52} Al _{2.45}) _{2.97} (Si _{3.03} O ₈)
0.28	—	26.48	42.09	0.30	20.60	—	—	—	—	7.55	—	97.33	(Ca _{1.71} Na _{0.04} K _{0.03}) _{1.78} (Fe _{0.44} Al _{2.41}) _{2.85} (Si _{3.25} O ₈)
—	—	27.93	38.69	—	23.90	0.26	—	—	—	7.91	—	98.66	(Ca _{1.98} Ti _{0.02}) _{2.00} (Fe _{0.46} Al _{2.55}) _{3.01} (Si _{2.99} O ₈)
—	—	23.30	37.98	—	23.70	—	—	—	—	12.53	—	97.48	Ca _{2.02} (Fe _{0.76} Al _{2.19}) _{2.95} (Si _{3.03} O ₈)
—	—	23.79	37.70	—	23.30	—	—	—	—	11.43	—	96.17	Ca _{2.01} (Fe _{0.70} Al _{2.26}) _{2.96} (Si _{3.03} O ₈)
—	—	27.11	38.11	—	23.80	—	—	—	—	7.64	—	96.68	Ca _{2.01} (Fe _{0.45} Al _{2.53}) _{2.98} (Si _{3.01} O ₈)
0.46	—	31.45	42.65	—	21.70	—	—	—	—	2.41	—	98.66	Клиноцоизит. (Ca _{1.74} Na _{0.07}) _{1.81} (Fe _{0.14} Al _{2.77}) _{2.91} (Si _{3.19} O ₈)
<i>Хлорит</i>													
—	8.43	20.08	25.38	—	0.13	—	—	—	0.32	35.12	—	89.45	(Fe _{2.29} Mg _{1.09} Al _{0.25} Mn _{0.03} Ca _{0.01}) _{3.67} (Si _{2.20} Al _{1.80}) _{4.00} O ₁₀ (OH) ₈
—	9.93	16.94	26.91	—	—	—	—	—	—	33.34	—	87.12	(Fe _{2.21} Mg _{1.31} Al _{0.13}) _{3.65} (Si _{2.37} Al _{1.63}) _{4.00} O ₁₀ (OH) ₈
—	13.10	19.44	26.35	—	—	—	—	—	0.37	29.21	—	88.48	(Fe _{1.86} Mg _{1.66} Al _{0.18} Mn _{0.03}) _{3.73} (Si _{2.23} Al _{1.77}) _{4.00} O ₁₀ (OH) ₈
—	13.10	19.92	26.37	—	0.19	0.51	—	—	0.41	28.27	—	88.73	(Fe _{1.79} Mg _{1.64} Al _{0.18} Ti _{0.03} Mn _{0.03} Ca _{0.02}) _{3.69} (Si _{2.22} Al _{1.78}) _{4.00} O ₁₀ (OH) ₈
—	13.60	19.74	26.89	—	—	—	—	—	0.34	27.82	—	88.37	(Fe _{1.76} Mg _{1.70} Al _{0.22} Mn _{0.02}) _{3.70} (Si _{2.26} Al _{1.74}) _{4.00} O ₁₀ (OH) ₈
<i>Амфибол. Актинолит</i>													
0.17	4.88	6.71	47.01	1.45	0.41	—	—	—	0.57	31.42	—	92.63	(Mg _{1.24} K _{0.32} Na _{0.07} Ca _{0.07} Mn _{0.08}) _{1.78} (Al _{1.34} Fe _{4.04}) _{5.38} Si _{7.95} O ₂₂
0.29	5.03	6.56	45.85	1.38	0.42	—	—	—	0.39	29.39	—	89.31	(Mg _{1.3} K _{0.31} Na _{0.10} Ca _{0.08} Mn _{0.06}) _{1.85} (Fe _{3.89} Al _{1.34}) _{5.23} Si _{7.97} O ₂₂
—	4.80	6.19	45.73	1.56	0.46	0.76	—	—	0.60	29.01	—	89.10	(Mg _{1.25} K _{0.35} Ca _{0.09} Mn _{0.09}) _{1.78} (Al _{1.28} Fe _{3.86}) _{5.14} Si ₈ O ₂₂
—	4.95	6.06	45.76	1.21	0.35	—	—	—	0.54	30.12	—	88.99	(Mg _{1.29} K _{0.27} Ca _{0.07} Mn _{0.08}) _{1.71} (Al _{1.25} Fe _{4.01}) _{5.26} Si _{8.01} O ₂₂
—	4.96	6.32	45.45	1.41	0.32	—	—	—	0.62	29.86	—	88.94	(Mg _{1.30} K _{0.32} Ca _{0.06} Mn _{0.09}) _{1.77} (Al _{1.31} Fe _{3.99}) _{5.30} Si _{7.98} O ₂₂
—	4.75	6.52	44.66	1.65	0.42	—	—	—	0.50	29.59	—	88.10	(Mg _{1.26} K _{0.37} Ca _{0.08} Mn _{0.08}) _{1.79} (Al _{1.37} Fe _{4.01}) _{5.38} Si _{7.94} O ₂₂
<i>Плагиоклаз</i>													
1.40	—	19.73	68.90	—	—	—	—	—	—	—	—	100.02	Альбит. Na _{0.97} (Al _{1.02} Si _{3.01} O ₈)
11.30	—	20.12	68.22	—	0.24	—	—	—	—	—	—	99.92	Альбит. (Na _{0.96} Ca _{0.01}) _{0.97} (Al _{1.04} Si _{2.99} O ₈)
11.10	—	20.25	67.73	—	1.24	—	—	—	—	—	—	100.27	Альбит. (Na _{0.94} Ca _{0.06}) _{1.00} (Al _{1.04} Si _{2.96} O ₈)
11.20	—	19.96	68.65	—	0.39	—	—	—	—	—	—	100.23	Альбит. (Na _{0.95} Ca _{0.02}) _{0.97} (Al _{1.03} Si _{3.00} O ₈)
11.00	—	20.23	67.02	—	1.00	—	—	—	—	—	—	99.30	Альбит. (Na _{0.94} Ca _{0.05}) _{0.99} (Al _{1.05} Si _{2.96} O ₈)

Na	Mg	Al	Si	K	Ca	Ti	V	Cr	Mn	Fe	Ba	Сумма	Эмпирическая формула
10.80	—	20.83	67.35	—	1.39	—	—	—	—	—	—	100.36	Альбит. $(\text{Na}_{0.92}\text{Ca}_{0.07})_{0.99}(\text{Al}_{1.06}\text{Si}_{2.95}\text{O}_8)$
10.40	—	18.42	70.44	—	—	—	—	—	—	—	—	99.26	Альбит. $\text{Na}_{0.90}(\text{Al}_{0.97}\text{Si}_{3.13}\text{O}_8)$
11.40	—	19.70	68.46	0.16	0.14	—	—	—	—	0.44	—	100.26	Альбит. $(\text{Na}_{0.96}\text{K}_{0.16}\text{Ca}_{0.14})_{1.26}(\text{Al}_{1.01}\text{Fe}_{0.01}\text{Si}_{2.99}\text{O}_8)$
11.10	—	18.46	65.45	0.26	—	—	—	—	—	3.50	—	98.71	Альбит. $(\text{Na}_{0.96}\text{K}_{0.26})_{1.24}(\text{Al}_{0.98}\text{Fe}_{0.12}\text{Si}_{2.93}\text{O}_8)$
11.20	—	19.50	68.83	—	—	—	—	—	—	—	—	99.49	Альбит. $\text{Na}_{0.95}(\text{Al}_{1.02}\text{Si}_{3.03}\text{O}_8)$
11.20	—	19.76	68.85	—	—	—	—	—	—	0.50	—	100.34	Альбит. $\text{Na}_{0.95}(\text{Al}_{1.02}\text{Fe}_{0.02}\text{Si}_{3.01}\text{O}_8)$
11.20	—	19.43	68.38	—	0.22	—	—	—	—	0.34	—	99.55	Альбит. $(\text{Na}_{0.96}\text{Ca}_{0.02})_{0.98}(\text{Al}_{1.00}\text{Fe}_{0.01}\text{Si}_{3.01}\text{O}_8)$
10.80	—	20.96	66.46	—	1.94	—	—	—	—	—	—	100.15	Олигоклаз. $(\text{Na}_{0.92}\text{Ca}_{0.09})_{1.01}(\text{Al}_{1.08}\text{Si}_{2.91}\text{O}_8)$
11.00	—	20.55	66.54	—	1.87	—	—	—	—	—	—	99.95	Олигоклаз. $(\text{Na}_{0.93}\text{Ca}_{0.09})_{1.02}(\text{Al}_{1.06}\text{Si}_{2.92}\text{O}_8)$

Пироксен

0.74	14.40	4.17	52.34	—	12.20	0.69	—	—	0.23	15.34	—	100.03	$(\text{Mg}_{0.81}\text{Ca}_{0.49}\text{Fe}_{0.44}\text{Al}_{0.19}\text{Na}_{0.05}\text{Ti}_{0.02}\text{Mn}_{0.01})_{2.01}\text{Si}_{1.99}\text{O}_6$
1.68	13.90	9.22	48.16	—	11.70	0.71	0.27	—	0.21	14.24	—	100.14	$(\text{Mg}_{0.77}\text{Ca}_{0.47}\text{Fe}_{0.40}\text{Al}_{0.41}\text{Na}_{0.12}\text{Ti}_{0.02}\text{Mn}_{0.01}\text{V}_{0.01})_{2.21}\text{Si}_{1.79}\text{O}_6$
1.80	11.30	6.43	46.99	0.75	11.00	1.90	—	—	0.32	19.09	—	99.61	$(\text{Mg}_{0.65}\text{Fe}_{0.55}\text{Ca}_{0.45}\text{Al}_{0.29}\text{Na}_{0.14}\text{Ti}_{0.06}\text{K}_{0.04}\text{Mn}_{0.01})_{2.19}\text{Si}_{1.81}\text{O}_6$
1.60	9.91	6.44	46.57	0.85	10.80	1.94	—	—	0.27	21.06	—	99.48	$(\text{Fe}_{0.62}\text{Mg}_{0.58}\text{Ca}_{0.45}\text{Al}_{0.30}\text{Na}_{0.12}\text{Ti}_{0.06}\text{K}_{0.04}\text{Mn}_{0.01})_{2.18}\text{Si}_{1.82}\text{O}_6$
0.20	8.30	0.36	50.84	—	19.70	—	—	—	0.53	20.13	—	100.07	$\text{Ca}_{0.84}\text{Fe}_{0.60}\text{Mg}_{0.49}\text{Al}_{0.02}\text{Na}_{0.02}\text{Mn}_{0.02})_{1.99}\text{Si}_{2.01}\text{O}_6$
—	8.50	0.50	50.45	—	19.90	—	—	—	0.39	19.27	—	99.01	$\text{Ca}_{0.85}\text{Fe}_{0.58}\text{Mg}_{0.51}\text{Al}_{0.02}\text{Mn}_{0.01})_{1.98}\text{Si}_{2.02}\text{O}_6$
0.21	12.60	1.80	51.05	—	20.70	0.70	—	—	0.39	12.71	—	100.11	Авгит. $(\text{Ca}_{0.84}\text{Mg}_{0.71}\text{Fe}_{0.37}\text{Al}_{0.08}\text{Na}_{0.02}\text{Ti}_{0.02}\text{Mn}_{0.01})_{2.05}\text{Si}_{1.95}\text{O}_6$
0.49	17.50	3.08	54.12	—	13.50	0.42	—	—	0.23	10.65	—	99.95	Авгит. $(\text{Mg}_{0.97}\text{Ca}_{0.54}\text{Fe}_{0.30}\text{Al}_{0.14}\text{Na}_{0.03}\text{Ti}_{0.01}\text{Mn}_{0.01})_{2.00}\text{Si}_{2.00}\text{O}_6$
—	14.90	0.51	53.44	—	21.80	—	—	—	0.27	9.11	—	100.01	Авгит. $(\text{Ca}_{0.88}\text{Mg}_{0.83}\text{Fe}_{0.26}\text{Al}_{0.02}\text{Mn}_{0.01})_{2.00}\text{Si}_{2.00}\text{O}_6$
—	18.00	—	57.54	—	13.80	—	—	—	0.17	10.70	—	100.13	Авгит. $(\text{Mg}_{1.00}\text{Ca}_{0.54}\text{Fe}_{0.30}\text{Mn}_{0.01})_{1.85}\text{Si}_{2.15}\text{O}_6$
—	11.80	0.54	51.76	—	21.10	—	—	—	0.40	14.13	—	99.68	Авгит. $(\text{Ca}_{0.87}\text{Mg}_{0.68}\text{Fe}_{0.41}\text{Al}_{0.03}\text{Mn}_{0.01})_{2.00}\text{Si}_{2.00}\text{O}_6$
0.44	6.50	3.03	48.74	—	12.70	—	—	—	0.66	25.29	—	97.32	Авгит. $(\text{Ca}_{0.85}\text{Fe}_{0.58}\text{Mg}_{0.51}\text{Al}_{0.02}\text{Mn}_{0.01})_{1.98}\text{Si}_{2.02}\text{O}_6$
—	15.70	0.76	53.29	—	22.70	—	—	—	0.41	7.26	—	100.12	Диопсид. $\text{Ca}_{0.90}(\text{Mg}_{0.87}\text{Fe}_{0.20}\text{Al}_{0.03}\text{Mn}_{0.01})_{1.11}\text{Si}_{1.99}\text{O}_6$
—	12.80	—	52.80	—	22.20	—	—	—	0.47	11.82	—	100.14	Диопсид. $\text{Ca}_{0.91}(\text{Mg}_{0.73}\text{Fe}_{0.34}\text{Mn}_{0.02})_{1.08}\text{Si}_{2.01}\text{O}_6$
—	14.90	1.03	52.53	—	22.20	—	—	—	0.22	8.58	—	99.43	Диопсид. $(\text{Ca}_{0.90}\text{Mg}_{0.83}\text{Fe}_{0.24}\text{Al}_{0.05}\text{Mn}_{0.01})_{2.02}\text{Si}_{1.98}\text{O}_6$

Мусковит

—	0.35	36.98	46.86	11.05	—	—	—	—	—	0.48	—	95.71	$\text{K}_{0.93}\text{Al}_{1.96}(\text{Al}_{0.91}\text{Si}_{3.09}\text{O}_{10})(\text{OH})_2$
—	0.44	33.67	46.57	10.93	—	—	—	—	—	1.89	—	93.49	$\text{K}_{0.95}\text{Al}_{1.87}(\text{Al}_{0.83}\text{Si}_{3.17}\text{O}_{10})(\text{OH})_2$

Метагаббро-долерит, в т.ч. меланократовый

Пироксен

0.17	16.50	2.39	55.36	—	13.30	—	—	0.33	0.18	11.55	—	99.74	$(\text{Mg}_{0.92}\text{Ca}_{0.54}\text{Fe}_{0.33}\text{Al}_{0.11}\text{Na}_{0.01}\text{Cr}_{0.01}\text{Mn}_{0.01})_{1.92}\text{Si}_{2.08}\text{O}_6$
1.11	14.10	5.92	51.60	—	12.00	0.31	—	0.36	—	14.32	—	99.71	$(\text{Mg}_{0.79}\text{Ca}_{0.49}\text{Fe}_{0.41}\text{Al}_{0.26}\text{Na}_{0.08}\text{Cr}_{0.01}\text{Ti}_{0.01})_{2.05}\text{Si}_{1.95}\text{O}_6$
0.87	11.50	5.47	50.82	—	12.20	0.35	—	—	0.30	18.26	—	99.74	$(\text{Mg}_{0.66}\text{Ca}_{0.51}\text{Fe}_{0.53}\text{Al}_{0.25}\text{Ti}_{0.01}\text{Mn}_{0.01})_{2.03}\text{Si}_{1.97}\text{O}_6$
0.39	14.70	1.29	54.99	—	11.70	0.21	—	—	0.25	15.65	—	99.22	$\text{Mg}_{0.84}\text{Ca}_{0.48}\text{Fe}_{0.45}\text{Al}_{0.06}\text{Na}_{0.03}\text{Ti}_{0.01}\text{Mn}_{0.01})_{1.88}\text{Si}_{2.12}\text{O}_6$
0.61	16.10	4.00	54.53	—	10.30	0.36	—	—	0.22	14.21	—	100.40	$(\text{Mg}_{0.90}\text{Ca}_{0.42}\text{Fe}_{0.40}\text{Al}_{0.18}\text{Na}_{0.04}\text{Ti}_{0.01}\text{Mn}_{0.01})_{1.96}\text{Si}_{2.04}\text{O}_6$
0.24	15.50	2.22	52.17	—	21.20	0.50	—	0.44	0.29	7.42	—	99.96	Авгит. $(\text{Mg}_{0.86}\text{Ca}_{0.84}\text{Fe}_{0.21}\text{Al}_{0.10}\text{Na}_{0.02}\text{Cr}_{0.02}\text{Mn}_{0.01})_{2.06}\text{Si}_{1.94}\text{O}_6$
0.16	18.90	1.13	57.10	—	13.50	—	—	0.46	0.16	8.87	—	100.23	Авгит. $(\text{Mg}_{1.04}\text{Ca}_{0.53}\text{Fe}_{0.25}\text{Al}_{0.05}\text{Na}_{0.01}\text{Cr}_{0.01}\text{Mn}_{0.01})_{1.90}\text{Si}_{2.10}\text{O}_6$
—	18.50	1.41	56.86	—	13.40	—	—	0.20	0.22	9.06	—	99.66	Авгит. $(\text{Mg}_{1.02}\text{Ca}_{0.53}\text{Fe}_{0.25}\text{Al}_{0.06}\text{Cr}_{0.01}\text{Mn}_{0.01})_{1.89}\text{Si}_{2.11}\text{O}_6$
0.24	17.90	1.50	56.91	—	13.00	—	—	0.40	0.19	9.65	—	99.78	Авгит. $(\text{Mg}_{1.00}\text{Ca}_{0.52}\text{Fe}_{0.27}\text{Al}_{0.07}\text{Na}_{0.02}\text{Cr}_{0.01}\text{Mn}_{0.01})_{1.88}\text{Si}_{2.12}\text{O}_6$
0.20	17.60	1.90	55.84	—	13.30	0.34	—	0.29	0.20	9.73	—	99.44	Авгит. $(\text{Mg}_{0.98}\text{Ca}_{0.53}\text{Fe}_{0.27}\text{Al}_{0.08}\text{Na}_{0.01}\text{Ti}_{0.01}\text{Cr}_{0.01}\text{Mn}_{0.01})_{1.91}\text{Si}_{2.09}\text{O}_6$
—	19.10	0.82	57.68	—	13.50	—	—	—	0.16	8.61	—	99.78	Авгит. $(\text{Mg}_{1.05}\text{Ca}_{0.53}\text{Fe}_{0.24}\text{Al}_{0.04}\text{Mn}_{0.01})_{1.87}\text{Si}_{2.13}\text{O}_6$

Na	Mg	Al	Si	K	Ca	Ti	V	Cr	Mn	Fe	Ba	Сумма	Эмпирическая формула
—	18.10	1.07	57.23	—	13.30	—	—	—	0.25	9.98	—	99.93	Авгит. (Mg _{1.01} Ca _{0.53} Fe _{0.28} Al _{0.05} Mn _{0.01}) _{1.87} Si _{2.13} O ₆
0.13	18.20	0.66	56.85	—	12.90	—	—	—	0.16	10.14	—	99.01	Авгит. (Mg _{1.02} Ca _{0.52} Fe _{0.29} Al _{0.03} Na _{0.01} Mn _{0.01}) _{1.87} Si _{2.13} O ₆
0.24	14.60	1.19	52.13	—	20.80	0.26	—	—	0.35	9.79	—	99.41	Авгит. (Ca _{0.84} Mg _{0.82} Fe _{0.28} Al _{0.05} Na _{0.02} Ti _{0.01} Mn _{0.01}) _{2.03} Si _{1.97} O ₆
0.26	14.60	1.69	51.89	—	20.60	0.89	—	—	0.28	9.37	—	99.54	Авгит. (Ca _{0.83} Mg _{0.82} Fe _{0.27} Al _{0.08} Na _{0.02} Ti _{0.02} Mn _{0.01}) _{2.04} Si _{1.96} O ₆
—	18.50	0.98	56.50	—	12.70	—	—	—	0.29	9.11	—	98.09	Авгит. (Mg _{1.04} Ca _{0.51} Fe _{0.26} Al _{0.04} Mn _{0.01}) _{1.87} Si _{2.13} O ₆
—	17.10	2.37	53.13	—	20.90	0.41	—	—	—	6.51	—	100.41	Авгит. (Mg _{0.94} Ca _{0.82} Fe _{0.18} Al _{0.10} Ti _{0.01}) _{2.05} Si _{1.95} O ₆
0.16	18.60	1.16	57.14	—	13.30	—	—	—	0.16	9.02	—	99.53	Авгит. (Mg _{1.03} Ca _{0.53} Fe _{0.25} Al _{0.05} Na _{0.01} Mn _{0.01}) _{1.88} Si _{2.12} O ₆
0.29	17.50	1.98	55.02	—	13.80	0.17	—	—	0.18	10.17	—	99.07	Авгит. (Mg _{0.98} Ca _{0.55} Fe _{0.29} Al _{0.09} Na _{0.02} Ti _{0.01} Mn _{0.01}) _{1.94} Si _{2.06} O ₆
0.27	19.70	1.01	58.19	—	13.10	—	—	—	—	7.86	—	100.10	Авгит. (Mg _{1.07} Ca _{0.51} Fe _{0.22} Al _{0.04} Na _{0.02}) _{1.87} Si _{2.13} O ₆
0.23	20.30	1.63	58.21	—	12.50	—	—	0.22	—	7.84	—	100.91	Авгит. (Mg _{1.10} Ca _{0.48} Fe _{0.21} Al _{0.07} Na _{0.02} Cr _{0.01}) _{1.89} Si _{2.11} O ₆
0.23	18.20	1.59	56.94	—	13.80	—	—	—	—	9.33	—	100.17	Авгит. (Mg _{1.00} Ca _{0.55} Fe _{0.26} Al _{0.07} Na _{0.02}) _{1.90} Si _{2.10} O ₆
0.32	14.70	1.85	51.92	—	22.90	0.65	—	—	0.44	6.96	—	99.65	Диопсид. (Ca _{0.91} Mg _{0.82} Fe _{0.20} Al _{0.18} Na _{0.02} Ti _{0.02} Mn _{0.01}) _{2.06} Si _{1.94} O ₆
<i>Хлорит</i>													
—	22.10	20.96	28.97	—	—	—	—	0.58	0.30	17.08	—	89.95	(Fe _{1.00} Mg _{2.55} Cr _{0.04} Al _{0.16} Mn _{0.02}) _{3.77} (Si _{2.25} Al _{1.75}) _{4.00} O ₁₀ (OH) ₈
—	19.90	20.42	28.36	—	—	—	—	—	—	19.66	—	88.30	(Fe _{1.18} Mg _{2.37} Al _{0.19}) _{3.74} (Si _{2.27} Al _{1.73}) _{4.00} O ₁₀ (OH) ₈
—	20.90	20.48	28.22	—	0.15	—	—	—	0.26	16.99	—	86.95	(Fe _{1.03} Mg _{2.49} Al _{0.20} Mn _{0.02} Ca _{0.01}) _{3.75} (Si _{2.26} Al _{1.74}) _{4.00} O ₁₀ (OH) ₈
—	21.50	20.27	28.59	—	0.28	—	—	—	0.23	16.52	—	87.39	(Fe _{0.99} Mg _{2.55} Al _{0.18} Mn _{0.02} Ca _{0.02}) _{3.76} (Si _{2.27} Al _{1.73}) _{4.00} O ₁₀ (OH) ₈
—	22.80	18.98	29.31	—	—	—	—	—	—	15.84	—	86.95	(Fe _{0.95} Mg _{2.70} Al _{0.11}) _{3.76} (Si _{2.33} Al _{1.67}) _{4.00} O ₁₀ (OH) ₈
<i>Плагиоклаз. Альбит</i>													
10.70	—	20.30	67.50	—	0.93	—	—	—	—	0.47	—	99.86	(Na _{0.91} Ca _{0.04}) _{0.95} (Al _{1.05} Fe _{0.02} Si _{2.98} O ₈)
11.40	—	19.25	68.68	—	0.59	—	—	—	—	0.49	—	100.43	Na _{0.97} Ca _{0.03}) _{1.97} (Al _{1.00} Si _{3.00} O ₈)
10.70	—	20.37	69.61	0.28	0.60	—	—	—	—	—	—	101.58	Na _{0.96} Ca _{0.01}) _{0.97} (Al _{1.04} Si _{2.99} O ₈)
10.00	—	17.70	72.81	—	—	—	—	—	—	—	—	100.51	Na _{0.86} (Al _{0.92} Si _{3.22} O ₈)
<i>Эпидот</i>													
—	—	28.06	39.27	—	23.90	—	0.40	—	—	6.90	—	98.53	Ca _{1.97} (Fe _{0.40} Al _{2.55} V _{0.02}) _{2.97} (Si _{3.03} O ₈)
—	—	32.84	39.76	—	24.50	—	—	—	—	2.08	—	99.17	Клиноцоизит. Ca _{1.97} (Fe _{0.12} Al _{2.91}) _{3.03} (Si _{3.00} O ₈)
—	—	31.09	39.29	—	24.40	—	—	—	—	3.56	—	98.37	Клиноцоизит. Ca _{2.00} (Fe _{0.20} Al _{2.80}) _{3.00} (Si _{3.00} O ₈)

Примечание. Прочерк: — не обнаружено.

Supplementary 1: ESM_2. Химический состав аксессуарных минералов метагаббро-долеритов центра Карской астроблемы, мас. %

O	Mg	Al	Si	S	Ca	Ti	V	Mn	Fe	Co	Ni	Cu	Zn	As	La	Ce	Nd	Сумма	Минерал
Кварцевый метагаббро-долерит																			
—	—	—	—	35.09	—	—	—	—	30.50	—	—	33.55	—	—	—	—	—	99.14	Халькопирит
31.84	—	—	—	—	—	31.21	0.91	1.53	34.32	—	—	—	—	—	—	—	—	99.82	Ильменит
40.69	—	0.35	14.26	—	20.12	23.79	—	—	0.75	—	—	—	—	—	—	—	—	99.95	Титанит
—	—	—	—	33.74	—	—	—	—	6.58	0.37	—	0.45	59.25	—	—	—	—	100.39	Сфалерит
—	—	—	—	35.16	—	—	—	—	30.76	—	—	33.21	—	—	—	—	—	99.12	Халькопирит
34.02	—	6.73	14.13	—	7.31	1.30	1.00	—	11.80	—	—	—	—	—	6.13	10.72	2.84	95.99	Алланит
—	—	—	—	34.86	—	—	—	—	30.93	—	—	33.77	—	—	—	—	—	99.55	Халькопирит
—	—	—	—	39.69	—	—	—	—	60.28	—	—	—	—	—	—	—	—	99.97	Пирротин
31.93	—	—	—	—	—	32.40	—	3.46	32.40	—	—	—	—	—	—	—	—	100.19	Ильменит
40.65	—	0.46	14.16	—	20.15	23.56	0.31	—	0.29	—	—	—	—	—	—	—	—	99.58	Титанит
40.67	—	1.41	14.57	—	20.37	21.15	0.35	—	0.98	—	—	—	—	—	—	—	—	99.50	Титанит
Метагаббро-долерит																			
41.07	0.54	1.46	15.51	—	18.98	20.25	0.31	—	1.36	—	—	—	—	—	—	—	—	99.49	Титанит
39.91	—	—	—	—	0.86	58.49	0.64	—	—	—	—	—	—	—	—	—	—	99.89	Рутил
40.76	—	0.67	14.33	—	20.09	22.89	0.58	—	0.24	—	—	—	—	—	—	—	—	99.57	Титанит
—	—	—	—	40.03	—	—	—	—	58.93	0.65	0.67	—	—	—	—	—	—	100.28	Пирротин
—	—	—	—	34.98	—	—	—	—	31.49	2.26	31.56	—	—	—	—	—	—	100.29	Пентландит
—	—	—	—	21.77	—	—	—	—	5.31	29.40	—	—	—	43.90	—	—	—	100.38	Кобальтин

Примечание. Прочерк — не обнаружено.