

Table S12. Results of GC–MS analysis of volatiles extracted by mechanical shock crushing from quartz (Blagodatnoye deposit, Yenisei ridge).

Formula	Name	<sup>1</sup> CAS/(NIST)	<sup>2</sup> MW	Quartz 111/76.5	
				<sup>3</sup> RT, min	<sup>4</sup> A, %
Aliphatic hydrocarbons					
Paraffins					
CH4	Methane	74-82-8	16	1.66	1.552
C2H6	Ethane	74-84-0	30	2.31	0.019
C5H12	n-Pentane	109-66-0	72	7.60	0.141
C6H14	n-Hexane	110-54-3	86	12.07	0.014
C7H16	n-Heptane	142-82-5	100	16.19	0.002
C8H18	n-Octane	111-65-9	114	20.35	0.057
C9H20	n-Nonane	111-84-2	128	24.26	0.064
C10H22	n-Decane	124-18-5	142	27.90	0.122
C11H24	n-Undecane	1120-21-4	156	31.26	0.031
C12H26	n-Dodecane	112-40-3	170	34.43	0.024
C13H28	n-Tridecane	629-50-5	184	38.64	0.030
C14H30	n-Tetradecane	629-59-4	198	45.14	0.058
C15H32	n-Pentadecane	629-62-9	212	55.45	0.057
C16H34	n-Hexadecane	544-76-3	226	71.90	0.048
C17H36	n-Heptadecane	629-78-7	240	98.82	0.041
Olefins					
C2H4	Ethylene	74-85-1	28	2.01	0.003
C4H8	2-Methyl-1-propene	115-11-7	56	5.69	0.024
C4H8	2-Butene	107-01-7	56	5.89	0.026
C5H8	1,3-Pentadiene	1574-41-0	68	8.46	0.051
C5H8	(E)-1,3-Pentadiene	2004-70-8	68	8.66	0.010
C6H12	1-Hexene	592-41-6	84	11.69	0.038
C6H10	(E)-2-methyl-1,3-pentadiene	926-54-5	82	12.77	0.005
C7H14	1-Heptene	592-76-7	98	15.81	0.020
C8H16	1-Octene	111-66-0	112	19.97	0.012
C9H18	1-Nonene	124-11-8	126	23.96	0.019
C10H20	1-Decene	872-05-9	140	27.63	0.021
C11H22	1-Undecene	821-95-4	154	31.01	0.019
C12H24	1-Dodecene	112-41-4	168	34.18	0.031
C13H26	1-Tridecene	2437-56-1	182	38.32	0.033
C14H28	1-Tetradecene	1120-36-1	196	44.59	0.037
C15H30	1-Pentadecene	13360-61-7	210	54.68	0.169
C17H34	1-Heptadecene	6765-39-5	238	96.79	0.035
Cyclic hydrocarbons					
Cycloalkanes (naphthenes) and cycloalkenes					
C5H10	Cyclopentane	287-92-3	70	8.25	0.022
C10H16	dl-Limonene	138-86-3	136	28.00	0.016
Arenes					

C <sub>6</sub> H <sub>6</sub>	Benzene	71-43-2	78	12.42	0.032
C <sub>7</sub> H <sub>8</sub>	Toluene	108-88-3	92	16.91	0.014
C <sub>7</sub> H <sub>7</sub> F	(Fluoromethyl)benzene	350-50-5	110	20.78	0.001
C <sub>8</sub> H <sub>10</sub>	Ethylbenzene	100-41-4	106	21.01	0.007
C <sub>8</sub> H <sub>10</sub>	p-Xylene	106-42-3	106	21.30	0.022
C <sub>8</sub> H <sub>10</sub>	o-Xylene	95-47-6	106	21.60	0.006
C <sub>8</sub> H <sub>8</sub>	Styrene	100-42-5	104	21.91	0.006
C <sub>8</sub> H <sub>10</sub>	m-Xylene	108-38-3	106	21.85	0.008
C <sub>8</sub> H <sub>9</sub> F	3-Fluoro-o-xylene	443-82-3	124	22.23	0.006
C <sub>8</sub> H <sub>9</sub> F	5-Fluoro-m-xylene	461-97-2	124	22.64	0.001
C <sub>8</sub> H <sub>9</sub> F	p-Fluoroethylbenzene	459-47-2	124	22.91	0.003
C <sub>9</sub> H <sub>12</sub>	Propylbenzene	103-65-1	120	24.91	0.008
C <sub>10</sub> H <sub>12</sub>	(2-Methyl-2-propenyl)-benzene	3290-53-7	132	27.18	0.008
C <sub>10</sub> H <sub>14</sub>	Butylbenzene	104-51-8	134	28.73	0.021
C <sub>11</sub> H <sub>16</sub>	Pentylbenzene	538-68-1	148	32.17	0.026
<b>Oxygenated hydrocarbons</b>					
<i>Alcohols</i>					
CH <sub>4</sub> O	Methanol	67-56-1	32	4.16	0.900
C <sub>2</sub> H <sub>6</sub> O	Ethanol	64-17-5	46	6.09	0.017
C <sub>3</sub> H <sub>8</sub> O	Isopropyl Alcohol	67-63-0	60	7.81	0.008
C <sub>3</sub> H <sub>8</sub> O	1-Propanol	71-23-8	60	8.81	0.007
C <sub>4</sub> H <sub>10</sub> O	1-Butanol	71-36-3	74	12.57	0.013
C <sub>5</sub> H <sub>6</sub> O <sub>2</sub>	2-Furanmethanol	98-00-0	98	19.00	0.003
C <sub>6</sub> H <sub>6</sub> O	Phenol	108-95-2	94	24.46	0.045
C <sub>7</sub> H <sub>8</sub> O	2-Methylphenol	95-48-7	108	25.99	0.004
C <sub>7</sub> H <sub>8</sub> O	3-Methylphenol	108-39-4	108	27.22	0.006
C <sub>7</sub> H <sub>8</sub> O	4-Methylphenol	106-44-5	108	28.06	0.013
C <sub>8</sub> H <sub>10</sub> O <sub>2</sub>	2-Phenoxyethanol	122-99-6	138	32.80	0.008
<i>Ethers and esters</i>					
C <sub>5</sub> H <sub>8</sub> O <sub>2</sub>	Methyl methacrylate	80-62-6	100	14.28	0.008
C <sub>5</sub> H <sub>8</sub> O	3,4-Dihydro-2H-pyran	110-87-2	84	16.44	0.020
C <sub>4</sub> H <sub>6</sub> O <sub>2</sub>	Butyrolactone	96-48-0	86	20.17	0.005
C <sub>6</sub> H <sub>10</sub> O <sub>2</sub>	γ-Hexalactone	695-06-7	114	26.95	0.011
C <sub>6</sub> H <sub>10</sub> O <sub>2</sub>	δ-Hexalactone	823-22-3	114	29.63	0.054
C <sub>7</sub> H <sub>12</sub> O <sub>2</sub>	γ-Heptalactone	105-21-5	128	30.66	0.005
C <sub>11</sub> H <sub>16</sub> O	1-(1,1-Dimethylethyl)-4-methoxy-benzene	5396-38-3	164	34.00	0.145
C <sub>8</sub> H <sub>14</sub> O <sub>2</sub>	γ-Octalactone	104-50-7	142	34.15	0.011
C <sub>9</sub> H <sub>16</sub> O <sub>2</sub>	γ-Nonalactone	104-61-0	156	38.57	0.015
C <sub>10</sub> H <sub>18</sub> O <sub>2</sub>	γ-Decalactone	706-14-9	170	45.34	0.021
C <sub>11</sub> H <sub>20</sub> O <sub>2</sub>	γ-Undecalactone	104-67-6	184	55.98	0.004
C <sub>12</sub> H <sub>22</sub> O <sub>2</sub>	γ-Dodecalactone	2305-05-7	198	73.30	0.024
C <sub>15</sub> H <sub>28</sub> O <sub>4</sub>	3-Methylbut-2-yl 3-methylpentyl ester succinic acid	(390641)	272	101.21	0.021

<i>Aldehydes</i>					
C <sub>2</sub> H <sub>4</sub> O	Acetaldehyde	75-07-0	44	4.94	0.049
C <sub>3</sub> H <sub>4</sub> O	2-Propenal	107-02-8	56	7.00	0.017
C <sub>3</sub> H <sub>6</sub> O	n-Propanal	123-38-6	58	7.25	0.031
C <sub>4</sub> H <sub>6</sub> O	2-Methyl-2-propenal	78-85-3	70	9.41	0.022
C <sub>4</sub> H <sub>8</sub> O	2-Methylpropanal	78-84-2	72	9.49	0.012
C <sub>4</sub> H <sub>8</sub> O	n-Butanal	123-72-8	72	10.24	0.006
C <sub>5</sub> H <sub>10</sub> O	3-Methylbutanal	590-86-3	86	13.43	0.035
C <sub>5</sub> H <sub>10</sub> O	n-Pentanal	110-62-3	86	14.41	0.024
C <sub>5</sub> H <sub>4</sub> O <sub>2</sub>	Furfural	98-01-1	96	16.99	0.002
C <sub>5</sub> H <sub>4</sub> O <sub>2</sub>	3-Furaldehyde	498-60-2	96	17.82	0.032
C <sub>6</sub> H <sub>12</sub> O	n-Hexanal	66-25-1	100	18.80	0.044
C <sub>7</sub> H <sub>14</sub> O	n-Heptanal	111-71-7	114	23.01	0.036
C <sub>7</sub> H <sub>6</sub> O	Benzaldehyde	100-52-7	106	23.72	0.061
C <sub>8</sub> H <sub>16</sub> O	2-Ethylhexanal	123-05-7	128	25.54	0.009
C <sub>8</sub> H <sub>16</sub> O	n-Octanal	124-13-0	128	26.88	0.118
C <sub>9</sub> H <sub>18</sub> O	n-Nonanal	124-19-6	142	30.44	0.167
C <sub>10</sub> H <sub>20</sub> O	n-Decanal	112-31-2	156	33.73	0.167
C <sub>11</sub> H <sub>22</sub> O	n-Undecanal	112-44-7	170	37.77	0.060
C <sub>12</sub> H <sub>24</sub> O	n-Dodecanal	112-54-9	184	43.82	0.065
C <sub>13</sub> H <sub>26</sub> O	n-Tridecanal	10486-19-8	198	53.48	0.085
C <sub>14</sub> H <sub>28</sub> O	n-Tetradecanal	124-25-4	212	68.98	0.090
C <sub>15</sub> H <sub>30</sub> O	n-Pentadecanal	2765-11-9	226	93.88	0.110
<i>Ketones</i>					
C <sub>3</sub> H <sub>6</sub> O	2-Propanone	67-64-1	58	7.33	0.037
C <sub>4</sub> H <sub>6</sub> O	2-Butenone	78-94-4	70	9.98	0.004
C <sub>4</sub> H <sub>6</sub> O <sub>2</sub>	2,3-Butanedione	431-03-8	86	10.33	0.003
C <sub>4</sub> H <sub>8</sub> O	2-Butanone	78-93-3	72	10.37	0.008
C <sub>5</sub> H <sub>10</sub> O	2-Pentanone	107-87-9	86	14.18	0.018
C <sub>5</sub> H <sub>8</sub> O	Cyclopentanone	120-92-3	84	16.73	0.005
C <sub>6</sub> H <sub>12</sub> O	2-Hexanone	591-78-6	100	18.54	0.011
C <sub>7</sub> H <sub>14</sub> O	2-Heptanone	110-43-0	114	22.71	0.017
C <sub>5</sub> H <sub>6</sub> O <sub>3</sub>	Dihydro-3-methyl-2,5-furandione	4100-80-5	114	25.94	0.041
C <sub>8</sub> H <sub>16</sub> O	2-Octanone	111-13-7	128	26.57	0.068
C <sub>9</sub> H <sub>18</sub> O	2-Nonanone	821-55-6	142	30.13	0.047
C <sub>10</sub> H <sub>20</sub> O	2-Decanone	693-54-9	156	33.38	0.048
C <sub>8</sub> H <sub>4</sub> O <sub>3</sub>	1,3-Isobenzofurandione	85-44-9	148	35.13	0.032
C <sub>11</sub> H <sub>22</sub> O	2-Undecanone	53452-70-3	170	37.24	0.023
C <sub>12</sub> H <sub>24</sub> O	2-Dodecanone	6175-49-1	184	42.96	0.014
C <sub>13</sub> H <sub>26</sub> O	3-Tridecanone	1534-26-5	198	47.53	0.014
C <sub>13</sub> H <sub>26</sub> O	2-Tridecanone	593-08-8	198	51.97	0.092
C <sub>14</sub> H <sub>28</sub> O	2-Tetradecanone	2345-27-9	212	66.85	0.058
C <sub>15</sub> H <sub>30</sub> O	2-Pentadecanone	2345-28-0	226	90.06	0.207
<i>Carboxylic acids</i>					

C <sub>2</sub> H <sub>4</sub> O <sub>2</sub>	Acetic acid	64-19-7	60	11.17	0.260
C <sub>3</sub> H <sub>6</sub> O <sub>2</sub>	n-Propanoic acid	79-09-4	74	15.51	0.016
C <sub>4</sub> H <sub>8</sub> O <sub>2</sub>	n-Butanoic acid	107-92-6	88	19.02	0.174
C <sub>5</sub> H <sub>10</sub> O <sub>2</sub>	3-Methylbutanoic acid	503-74-2	102	22.10	0.018
C <sub>5</sub> H <sub>10</sub> O <sub>2</sub>	n-Pentanoic acid	109-52-4	102	23.13	0.064
C <sub>6</sub> H <sub>12</sub> O <sub>2</sub>	n-Hexanoic acid	142-62-1	116	26.62	0.229
C <sub>7</sub> H <sub>14</sub> O <sub>2</sub>	n-Heptanoic acid	111-14-8	130	30.16	0.076
C <sub>8</sub> H <sub>16</sub> O <sub>2</sub>	n-Octanoic acid	124-07-2	144	33.23	0.156
C <sub>9</sub> H <sub>18</sub> O <sub>2</sub>	n-Nonanoic acid	112-05-0	158	36.93	0.098
C <sub>10</sub> H <sub>20</sub> O <sub>2</sub>	n-Decanoic acid	334-48-5	172	42.46	0.098
C <sub>11</sub> H <sub>22</sub> O <sub>2</sub>	n-Undecanoic acid	112-37-8	186	51.87	0.017
C <sub>12</sub> H <sub>24</sub> O <sub>2</sub>	n-Dodecanoic acid	143-07-7	200	65.14	0.185
C <sub>14</sub> H <sub>28</sub> O <sub>2</sub>	n-Tetradecanoic acid	544-63-8	228	123.27	2.698
<b>Heterocyclic compounds</b>					
<i>Dioxanes</i>					
C <sub>4</sub> H <sub>8</sub> O <sub>2</sub>	1,4-Dioxane	123-91-1	88	13.37	0.001
<i>Furans</i>					
C <sub>5</sub> H <sub>6</sub> O	2-Methylfuran	534-22-5	82	10.14	0.001
C <sub>6</sub> H <sub>8</sub> O	2-Ethylfuran	3208-16-0	96	13.98	<0.001
C <sub>6</sub> H <sub>6</sub> O	2-Vinylfuran	1487-18-9	94	14.68	<0.001
C <sub>8</sub> H <sub>12</sub> O	2-Butylfuran	4466-24-4	124	23.29	0.003
C <sub>9</sub> H <sub>14</sub> O	2-Pentylfuran	3777-69-3	138	26.19	0.005
<b>Nitrogenated compounds</b>					
N <sub>2</sub>	Nitrogen	7727-37-9	28	1.53	5.025
C <sub>2</sub> H <sub>3</sub> N	Acetonitrile	75-05-8	41	6.53	0.069
C <sub>3</sub> H <sub>5</sub> N	Propargylamine	2450-71-7	55	9.06	0.002
C <sub>4</sub> H <sub>5</sub> N	Pyrrole	109-97-7	67	14.22	0.013
C <sub>2</sub> H <sub>5</sub> NO	Acetamide	60-35-5	59	14.81	0.054
C <sub>5</sub> H <sub>5</sub> N	Pyridine	110-86-1	79	14.93	0.005
C <sub>5</sub> H <sub>7</sub> N	3-Methyl-1H-pyrrole	616-43-3	81	14.78	0.001
C <sub>3</sub> H <sub>5</sub> NO <sub>2</sub>	2-Oxo-propionamide	x	87	16.81	0.038
C <sub>6</sub> H <sub>9</sub> N	2,3-dimethyl-1H-pyrrole	600-28-2	95	18.04	0.002
C <sub>6</sub> H <sub>7</sub> N	2-Methylpyridine	109-06-8	93	18.37	0.002
C <sub>6</sub> H <sub>7</sub> N	3-Methylpyridine	108-99-6	93	20.00	0.002
C <sub>6</sub> H <sub>7</sub> N	4-Methylpyridine	108-89-4	93	20.10	0.003
C <sub>3</sub> H <sub>4</sub> N <sub>2</sub>	1H-Pyrazole	288-13-1	68	22.25	0.018
C <sub>5</sub> H <sub>11</sub> NO	Pentanamide	626-97-1	101	25.62	0.020
C <sub>4</sub> H <sub>7</sub> NO	2-Pyrrolidinone	616-45-5	85	25.75	0.021
C <sub>6</sub> H <sub>8</sub> N <sub>2</sub> O	2-Methoxy-6-methyl-pyrazine	2882-21-5	124	27.08	0.022
C <sub>4</sub> H <sub>5</sub> NO <sub>2</sub>	Succinimide	123-56-8	99	28.03	0.038
C <sub>10</sub> H <sub>11</sub> NO <sub>4</sub>	Acetate 3-nitrobenzeneethanol	68527-46-8	209	96.09	0.369
C <sub>11</sub> H <sub>23</sub> NO	Undecanamide	x	185	97.87	0.059
C <sub>12</sub> H <sub>25</sub> NO	Dodecanamide	1120-16-7	199	128.71	0.041

Sulfonated compounds					
H <sub>2</sub> S	Hydrogen sulfide	7783-06-4	34	2.69	0.004
COS	Carbonyl sulfide	463-58-1	60	3.33	0.004
O <sub>2</sub> S	Sulfur dioxide	7446-09-5	64	5.37	0.115
CH <sub>4</sub> S	Methanethiol	74-93-1	48	5.37	0.006
CS <sub>2</sub>	Carbon disulfide	75-15-0	76	7.67	0.003
C <sub>3</sub> H <sub>8</sub> S	(Methylthio)ethane	624-89-5	76	10.84	0.001
C <sub>2</sub> H <sub>6</sub> S <sub>2</sub>	Dimethyl disulfide	624-92-0	94	15.15	0.003
C <sub>5</sub> H <sub>6</sub> S	2-Methylthiophene	554-14-3	98	15.79	0.001
C <sub>5</sub> H <sub>6</sub> S	3-Methylthiophene	616-44-4	98	17.89	0.001
Inorganic compounds					
<i>Oxides</i>					
CO <sub>2</sub>	Carbon dioxide	124-38-9	44	1.73	8.451
H <sub>2</sub> O	Water	7732-18-5	18	2.94	75.079
<i>Noble gases</i>					
Ar	Argon	7440-37-1	40	1.50	0.048

Note: 1CAS/(NIST) – unique numerical identifier of chemical compounds included in the register Chemical Abstracts Service (<https://www.cas.org>) or NIST number (a unique number given to each spectrum in the NIST archive); 2MW – nominal mass; 3RT – retention time; 4A – normalized area (the area ratio of the individual gas mixture components to the sum of the areas of all the components in the chromatogram).