

Table S2. Results of GC–MS analysis of volatiles extracted by mechanical shock crushing of olivines from experiment 4-37-21 in the olivine–serpentine–anthracene–FeNi system at 1300 °C and 3.0 GPa.

Formula	Name	¹ CAS/(NIST)	² MW	4-37-21	
				³ RT, min	⁴ A, %
Aliphatic hydrocarbons					
Paraffins					
CH4	Methane	74-82-8	16	1.68	51.108
C2H6	Ethane	74-84-0	30	2.37	5.615
C3H8	n-Propane	74-98-6	44	4.13	2.034
C4H10	Isobutane	75-28-5	58	5.65	0.249
C4H10	n-Butane	106-97-8	58	6.03	0.593
C5H12	2-Methylbutane	78-78-4	72	7.98	0.114
C5H12	n-Pentane	109-66-0	72	8.39	0.115
C6H14	n-Hexane	110-54-3	86	11.76	0.037
C7H16	n-Heptane	142-82-5	100	15.74	0.033
C8H18	n-Octane	111-65-9	114	19.80	0.047
C9H20	n-Nonane	111-84-2	128	23.66	0.046
C10H22	n-Decane	124-18-5	142	27.24	0.039
C11H24	n-Undecane	1120-21-4	156	30.54	0.029
C12H26	n-Dodecane	112-40-3	170	33.61	0.035
C13H28	n-Tridecane	629-50-5	184	37.34	0.034
C14H30	n-Tetradecane	629-59-4	198	42.91	0.044
C15H32	n-Pentadecane	629-62-9	212	51.59	0.047
C16H34	n-Hexadecane	544-76-3	226	65.56	0.027
C17H36	n-Heptadecane	629-78-7	240	87.76	0.055
Olefins					
C3H6	Propene	115-07-1	42	4.00	0.012
C5H10	1-Pentene	109-67-1	70	8.09	0.049
C5H8	1,4-Pentadiene	591-93-5	68	8.29	0.052
C5H8	Isoprene	78-79-5	68	8.43	0.010
C5H8	(E)-1,3-Pentadiene	2004-70-8	68	8.56	0.009
C5H8	(Z)-1,3-Pentadiene	1574-41-0	68	8.84	0.009
C6H12	1-Hexene	592-41-6	84	11.42	0.007
C6H10	1,4-Hexadiene	592-45-0	82	11.61	0.004
C6H10	(3E)-1,3-Hexadiene	592-48-3	82	11.87	0.005
C6H10	(2E,4E)-2,4-Hexadiene	592-46-1	82	12.22	0.003
C6H10	(Z)-3-Methyl-1,3-pentadiene	2787-45-3	82	12.36	0.005
C6H10	(E)-3-Methyl-1,3-pentadiene	2787-43-1	82	12.52	0.014
C6H10	(Z),(Z)-2,4-Hexadiene	6108-61-8	82	12.81	0.010
C7H14	1-Heptene	592-76-7	98	15.40	0.016
C7H14	3-Methyl-3-hexene	3404-65-7	98	15.50	0.004
C7H14	2-Methyl-2-hexene	2738-19-4	98	15.62	0.007
C8H16	1-Octene	111-66-0	112	19.48	0.020
C9H18	1-Nonene	124-11-8	126	23.38	0.022
C10H20	1-Decene	872-05-9	140	26.99	0.013
C11H22	1-Undecene	821-95-4	154	30.34	0.017
C12H24	1-Dodecene	112-41-4	168	33.39	0.032
Cyclic hydrocarbons					
Arenes					
C6H6	Benzene	71-43-2	78	12.31	0.175
C7H8	Toluene	108-88-3	92	16.70	0.123

C ₈ H ₁₀	Ethylbenzene	100-41-4	106	20.72	0.028
C ₈ H ₁₀	p-Xylene	106-42-3	106	20.98	0.097
C ₈ H ₁₀	o-Xylene	95-47-6	106	21.08	0.012
C ₈ H ₁₀	m-Xylene	108-38-3	106	21.48	0.047
C ₈ H ₈	Styrene	100-42-5	104	21.62	0.016
C ₉ H ₁₂	Propylbenzene	103-65-1	120	24.53	0.033
C ₁₀ H ₁₄	p-Cymene	99-87-6	134	27.34	0.017
C ₉ H ₁₂	1-Ethyl-4-methylbenzene	622-96-8	120	27.76	0.020
C ₁₀ H ₁₄	o-Cymene	527-84-4	134	27.91	0.008
C ₁₀ H ₁₄	Butylbenzene	104-51-8	134	28.28	0.020
C ₁₀ H ₁₄	m-Cymene	535-77-3	134	28.68	0.006
C ₁₁ H ₁₆	Pentylbenzene	538-68-1	148	31.64	0.030
C ₁₂ H ₁₈	Hexylbenzene	1077-16-3	162	34.97	0.029
C ₁₄ H ₂₂	Octylbenzene	2189-60-8	190	46.48	0.048
C ₁₅ H ₂₄	Nonylbenzene	1081-77-2	204	57.27	0.044
<i>Polycyclic aromatic hydrocarbons (PAH)</i>					
C ₁₀ H ₈	Naphthalene	91-20-3	128	31.81	0.008
Oxygenated hydrocarbons					
<i>Alcohols</i>					
CH ₄ O	Methyl Alcohol	67-56-1	32	4.20	0.215
C ₂ H ₆ O	Ethanol	64-17-5	46	6.30	0.143
C ₃ H ₈ O	Isopropyl Alcohol	67-63-0	60	7.98	0.029
C ₄ H ₁₀ O	1-Butanol	71-36-3	74	12.82	0.111
C ₅ H ₆ O ₂	2-Furanmethanol	98-00-0	98	19.32	0.005
C ₆ H ₆ O	Phenol	108-95-2	94	24.53	0.092
C ₇ H ₈ O	2-Methylphenol	95-48-7	108	25.80	0.004
C ₇ H ₈ O	3-Methylphenol	108-39-4	108	27.21	0.011
C ₇ H ₈ O	4-Methylphenol	106-44-5	108	28.09	0.028
C ₈ H ₁₆ O	1-Ethylcyclohexanol	1940-18-7	128	28.13	0.005
C ₉ H ₁₈ O	1-Isopropylcyclohexanol	3552-01-0	142	29.56	0.007
<i>Ethers and esters</i>					
C ₅ H ₈ O ₂	Methyl methacrylate	80-62-6	100	14.22	0.093
C ₄ H ₆ O ₂	Butyrolactone	96-48-0	86	20.78	0.046
C ₅ H ₈ O ₂	δ-Valerolactone	542-28-9	100	26.46	0.033
C ₆ H ₁₀ O ₂	γ-Hexalactone	695-06-7	114	26.81	0.010
C ₉ H ₁₈ O ₂	Hexanoic acid propyl ester	626-77-7	158	30.29	0.004
C ₇ H ₁₂ O ₂	γ-Heptalactone	105-21-5	128	30.84	0.009
C ₇ H ₁₂ O ₄	Dimethyl pentanedioate	1119-40-0	160	30.91	0.019
C ₈ H ₁₄ O ₂	γ-Octalactone	104-50-7	142	34.24	0.014
C ₈ H ₁₄ O ₂	δ-Octalactone	698-76-0	142	35.19	0.005
C ₉ H ₁₆ O ₂	γ-Nonalactone	104-61-0	156	38.57	0.030
C ₉ H ₁₆ O ₂	δ-Nonalactone	3301-94-8	156	39.92	0.004
C ₁₀ H ₁₈ O ₂	γ-Decalactone	706-14-9	170	45.00	0.033
C ₁₀ H ₁₈ O ₂	δ-Decalactone	705-86-2	170	47.04	0.007
C ₁₁ H ₂₀ O ₂	γ-Undecalactone	104-67-6	184	55.15	0.010
C ₁₂ H ₂₂ O ₂	γ-Dodecalactone	2305-05-7	198	71.06	0.064
C ₁₂ H ₂₂ O ₂	δ-Dodecalactone	713-95-1	198	76.55	0.027
C ₁₃ H ₁₄ O ₂	3-tert-Butyl-2-benzopyran-1-one	x	202	82.88	3.425
C ₁₃ H ₂₄ O ₂	γ-Tridecalactone	x	212	107.64	0.665
<i>Aldehydes</i>					
C ₂ H ₄ O	Acetaldehyde	75-07-0	44	5.21	0.047
C ₃ H ₄ O	2-Propenal	107-02-8	56	7.04	0.113
C ₃ H ₆ O	n-Propanal	123-38-6	58	7.49	0.667

C ₄ H ₆ O	2-Methyl-2-propenal	78-85-3	70	9.54	0.094
C ₄ H ₈ O	2-Methylpropanal	78-84-2	72	9.58	0.012
C ₄ H ₈ O	n-Butanal	123-72-8	72	10.36	0.027
C ₄ H ₆ O	2-Butenal	4170-30-3	70	11.96	0.022
C ₅ H ₈ O	2-Methyl-2-butenal	1115-11-3	84	13.21	0.025
C ₅ H ₈ O	3-Methyl-2-butenal	107-86-8	84	13.37	0.006
C ₅ H ₁₀ O	3-Methylbutanal	590-86-3	86	13.47	0.013
C ₅ H ₁₀ O	n-Pentanal	110-62-3	86	14.46	0.031
C ₅ H ₈ O	(E)-2-Pentenal	1576-87-0	84	16.69	0.047
C ₅ H ₄ O ₂	2-Furaldehyde	98-01-1	96	17.24	0.009
C ₅ H ₄ O ₂	3-Furaldehyde	498-60-2	96	18.12	0.113
C ₆ H ₁₂ O	n-Hexanal	66-25-1	100	18.75	0.063
C ₇ H ₁₄ O	n-Heptanal	111-71-7	114	22.85	0.056
C ₆ H ₆ O ₂	5-Methyl-2-furancarboxaldehyde	620-02-0	110	23.13	0.011
C ₇ H ₆ O	Benzaldehyde	100-52-7	106	23.80	0.107
C ₈ H ₁₆ O	2-Ethylhexanal	123-05-7	128	25.30	0.022
C ₈ H ₁₆ O	n-Octanal	124-13-0	128	26.65	0.049
C ₆ H ₄ O ₃	2,5-Furandicarboxaldehyde	823-82-5	124	27.53	0.296
C ₉ H ₁₈ O	n-Nonanal	124-19-6	142	30.13	0.110
C ₁₀ H ₂₀ O	n-Decanal	112-31-2	156	33.32	0.102
C ₁₁ H ₂₂ O	n-Undecanal	112-44-7	170	37.05	0.069
C ₁₂ H ₂₄ O	n-Dodecanal	112-54-9	184	42.55	0.084
C ₁₃ H ₂₆ O	n-Tridecanal	10486-19-8	198	51.12	0.116
C ₁₄ H ₂₈ O	n-Tetradecanal	124-25-4	212	64.70	0.102
C ₁₅ H ₃₀ O	n-Pentadecanal	2765-11-9	226	86.41	0.267
Ketones					
C ₃ H ₆ O	2-Propanone	67-64-1	58	7.79	0.221
C ₄ H ₆ O	2-Butenone	78-94-4	70	10.16	0.037
C ₄ H ₆ O ₂	2,3-Butanedione	431-03-8	86	10.46	0.012
C ₄ H ₈ O	2-Butanone	78-93-3	72	10.54	0.024
C ₅ H ₁₀ O	2-Pentanone	107-87-9	86	14.22	0.015
C ₅ H ₈ O	Cyclopentanone	120-92-3	84	16.95	0.018
C ₆ H ₁₂ O	2-Hexanone	591-78-6	100	18.50	0.008
C ₇ H ₁₄ O	3-Heptanone	106-35-4	114	22.25	0.008
C ₆ H ₈ O	2-Cyclohexen-1-one	930-68-7	96	22.52	0.013
C ₇ H ₁₄ O	2-Heptanone	110-43-0	114	22.58	0.004
C ₈ H ₁₄ O	2-Methyl-1-hepten-6-one	10408-15-8	126	25.55	0.018
C ₈ H ₁₄ O	4-Methyl-3-hepten-2-one	22319-25-1	126	25.70	0.010
C ₈ H ₁₄ O	6-Methyl-5-hepten-2-one	110-93-0	126	25.81	0.017
C ₈ H ₁₆ O	2-Octanone	111-13-7	128	26.35	0.063
C ₉ H ₁₈ O	2-Nonanone	821-55-6	142	29.81	0.015
C ₅ H ₆ O ₃	Dihydro-2H-pyran-2,6(3H)-dione	108-55-4	114	31.02	0.022
C ₁₀ H ₂₀ O	2-Decanone	693-54-9	156	33.02	0.016
C ₈ H ₄ O ₃	1,3-Isobenzofurandione	85-44-9	148	35.59	0.369
C ₁₁ H ₂₂ O	2-Undecanone	53452-70-3	170	36.54	0.018
C ₁₂ H ₂₄ O	2-Dodecanone	6175-49-1	184	41.73	0.013
C ₁₃ H ₂₆ O	2-Tridecanone	593-08-8	198	49.84	0.020
C ₁₄ H ₂₈ O	2-Tetradecanone	2345-27-9	212	62.68	0.051
C ₁₃ H ₁₆ O ₂	1-(4-Methylphenyl)hexane-2,5-dione	x	204	79.30	0.024
C ₁₅ H ₃₀ O	2-Pentadecanone	2345-28-0	226	83.40	0.162
Carboxylic acids					
C ₂ H ₄ O ₂	Acetic acid	64-19-7	60	11.29	0.525

C ₃ H ₆ O ₂	n-Propanoic acid	79-09-4	74	15.22	0.027
C ₄ H ₈ O ₂	n-Butanoic acid	107-92-6	88	18.82	0.320
C ₅ H ₁₀ O ₂	3-Methylbutanoic acid	503-74-2	102	21.85	0.024
C ₅ H ₁₀ O ₂	n-Pentanoic acid	109-52-4	102	22.75	0.102
C ₆ H ₁₂ O ₂	n-Hexanoic acid	142-62-1	116	26.28	0.304
C ₇ H ₁₄ O ₂	n-Heptanoic acid	111-14-8	130	29.66	0.082
C ₈ H ₁₆ O ₂	n-Octanoic acid	124-07-2	144	32.74	0.174
C ₉ H ₁₈ O ₂	n-Nonanoic acid	112-05-0	158	36.12	0.095
C ₁₀ H ₂₀ O ₂	n-Decanoic acid	334-48-5	172	41.08	0.081
C ₁₁ H ₂₂ O ₂	n-Undecanoic acid	112-37-8	186	48.98	0.018
C ₁₂ H ₂₄ O ₂	n-Dodecanoic acid	143-07-7	200	61.02	0.091
C ₁₄ H ₂₈ O ₂	n-Tetradecanoic acid	544-63-8	228	114.35	0.131
Heterocyclic compounds					
<i>Dioxanes</i>					
C ₄ H ₈ O ₂	1,4-Dioxane	123-91-1	88	13.49	0.005
C ₄ H ₈ O ₂	1,3-Dioxane	505-22-6	88	17.47	0.005
<i>Furans</i>					
C ₄ H ₄ O	Furan	110-00-9	68	6.89	0.049
C ₅ H ₆ O	2-Methylfuran	534-22-5	82	10.06	0.018
C ₅ H ₆ O	3-Methylfuran	930-27-8	82	10.38	0.007
C ₆ H ₈ O	2-Ethylfuran	3208-16-0	96	13.77	0.004
C ₆ H ₆ O	2-Vinylfuran	1487-18-9	94	14.57	0.004
C ₇ H ₁₀ O	2-Propylfuran	4229-91-8	110	17.74	0.005
C ₇ H ₁₀ O	2-Ethyl-5-methylfuran	1703-52-2	110	21.72	0.005
C ₈ H ₁₂ O	2-Butylfuran	4466-24-4	124	21.92	0.005
C ₉ H ₁₄ O	2-Pentylfuran	3777-69-3	138	25.73	0.010
C ₁₀ H ₁₆ O	2-Hexylfuran	3777-70-6	152	29.26	0.003
C ₁₁ H ₁₈ O	2-Heptylfuran	3777-71-7	166	32.51	0.005
C ₁₂ H ₂₀ O	2-Octylfuran	4179-38-8	180	35.92	0.007
C ₁₃ H ₂₂ O	2-Nonylfuran	4179-38-8	194	40.83	0.006
C ₁₄ H ₂₄ O	2-Decylfuran	83469-85-6	208	48.64	0.006
C ₁₅ H ₂₆ O	2-Undecylfuran	x	222	60.62	0.007
Nitrogenated compounds					
N ₂	Nitrogen	7727-37-9	28	1.63	20.312
C ₂ H ₃ N	Acetonitrile	75-05-8	41	6.81	0.203
C ₃ H ₅ N	Propanenitrile	107-12-0	55	9.33	0.008
C ₃ H ₈ N ₂	1,2-Dimethyldiaziridine	6794-95-2	72	11.09	0.030
C ₄ H ₅ N	1H-Pyrrole	109-97-7	67	14.46	0.009
C ₅ H ₅ N	Pyridine	110-86-1	79	15.37	0.023
C ₂ H ₅ NO	Acetamide	60-35-5	59	16.10	0.054
C ₅ H ₉ N	Pentanenitrile	110-59-8	83	17.32	0.012
C ₃ H ₅ NO ₂	2-Oxo-propanamide	631-66-3	87	17.37	0.007
C ₄ H ₆ N ₂	1-Methyl-1H-pyrazole	930-36-9	82	18.04	0.019
C ₆ H ₉ N	2,3-Dimethyl-1H-pyrrole	600-28-2	95	18.22	0.005
C ₆ H ₇ N	2-Methylpyridine	109-06-8	93	18.64	0.004
C ₆ H ₇ N	3-Methylpyridine	108-99-6	93	20.33	0.004
C ₆ H ₇ N	4-Methylpyridine	108-89-4	93	20.50	0.003
C ₃ H ₄ N ₂	1H-Pyrazole	288-13-1	68	22.80	0.041
C ₇ H ₅ N	Benzonitrile	100-47-0	103	24.60	0.015
C ₅ H ₁₁ NO	Pentanamide	626-97-1	101	27.43	0.004
C ₄ H ₅ NO ₂	Succinimide	123-56-8	99	28.76	0.030
C ₈ H ₁₅ N	Octanenitrile	124-12-9	125	29.19	0.003
C ₆ H ₁₃ NO	Hexanamide	628-02-4	115	30.94	0.007
C ₇ H ₁₅ NO	Enanthamide	628-62-6	129	34.19	0.005

C ₈ H ₁₇ NO	Octanamide	629-01-6	143	38.35	0.011
C ₉ H ₁₁ NO	Phenylpropanamide	102-93-2	149	43.65	1.095
C ₉ H ₁₉ NO	Nonanamide	1120-07-6	157	44.65	0.007
C ₁₀ H ₂₁ NO	Decanamide	2319-29-1	171	54.35	0.014
Sulfonated compounds					
H ₂ S	Hydrogen sulfide	7783-06-4	34	2.73	0.002
COS	Carbonyl sulfide	463-58-1	60	3.38	0.004
O ₂ S	Sulfur dioxide	7446-09-5	64	4.71	0.279
CH ₄ S	Methanethiol	74-93-1	48	5.43	0.042
CS ₂	Carbon disulfide	75-15-0	76	7.54	0.036
C ₂ H ₆ S	Dimethyl sulfide	75-18-3	62	7.69	0.005
C ₄ H ₄ S	Thiophene	110-02-1	84	12.06	0.005
C ₂ H ₆ S ₂	Dimethyl disulfide	624-92-0	94	15.07	0.004
C ₅ H ₆ S	2-Methylthiophene	554-14-3	98	16.20	0.003
C ₅ H ₆ S	3-Methylthiophene	616-44-4	98	16.55	0.003
C ₆ H ₈ S	2-Ethylthiophene	872-55-9	112	21.12	0.005
C ₆ H ₈ S	3-Ethylthiophene	1795-01-3	112	21.47	0.011
C ₈ H ₁₂ S	2-Butylthiophene	1455-20-5	140	27.51	0.004
C ₈ H ₁₂ S	3-Butylthiophene	34722-01-5	140	28.39	0.004
C ₁₀ H ₁₆ S	3-Hexylthiophene	1693-86-3	168	34.77	0.003
C ₁₁ H ₁₈ S	2-Heptylthiophene	18794-78-0	182	39.22	0.004
Inorganic compounds					
Oxides					
CO ₂	Carbon dioxide	124-38-9	44	1.73	0.437
H ₂ O	Water	7732-18-5	18	3.31	4.398
Noble gases					
Ar	Argon	7440-37-1	40	1.68	0.308

Note: ¹CAS/(NIST) – unique numerical identifier of chemical compounds included in the register Chemical Abstracts Service (<https://www.cas.org>) или 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).