Supplement of Eur. J. Mineral., 33, 519–535, 2021
https://doi.org/10.5194/ejm-33-519-2021-supplement

European Journal of Mineralogy
Open Access

Supplement of

Equation of state and sound wave velocities of fayalite at high pressures and temperatures: implications for the seismic properties of the martian mantle

Frédéric Béjina et al.

Correspondence to: Frédéric Béjina (frederic.bejina@irap.omp.eu)

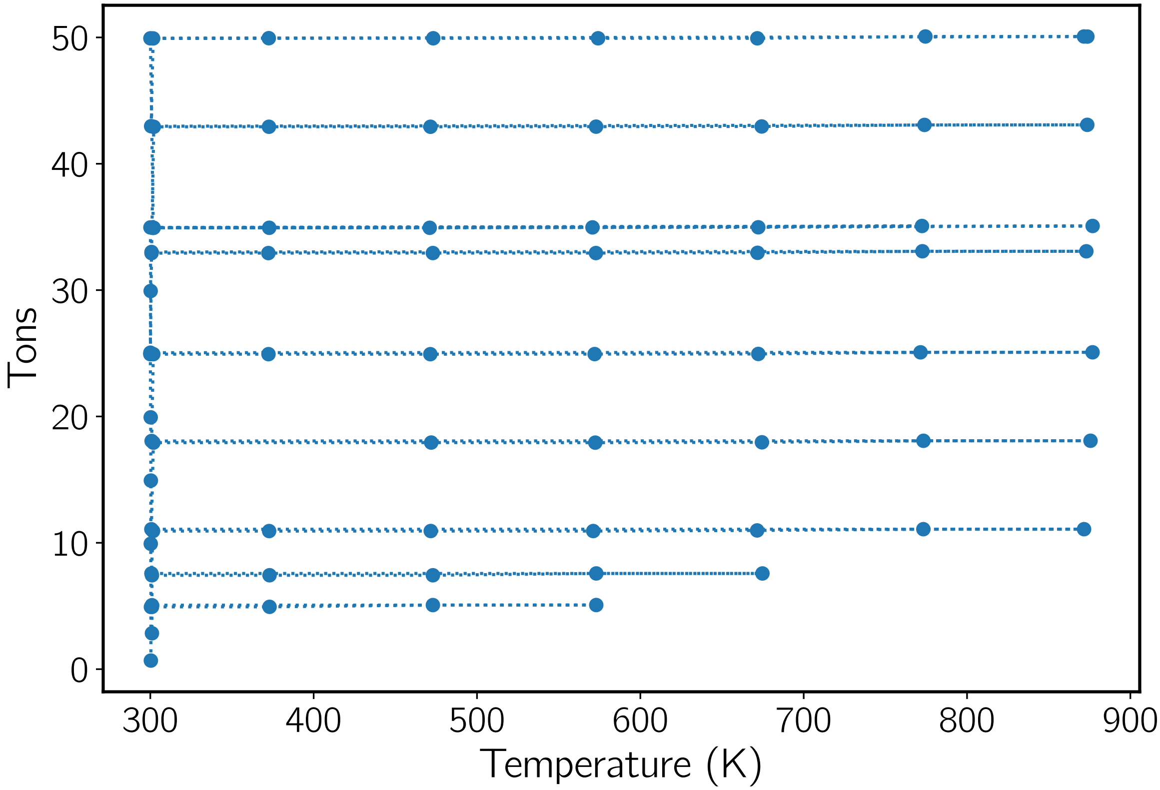

Figure S1. Tons-Temperature space sampled during our experiment.

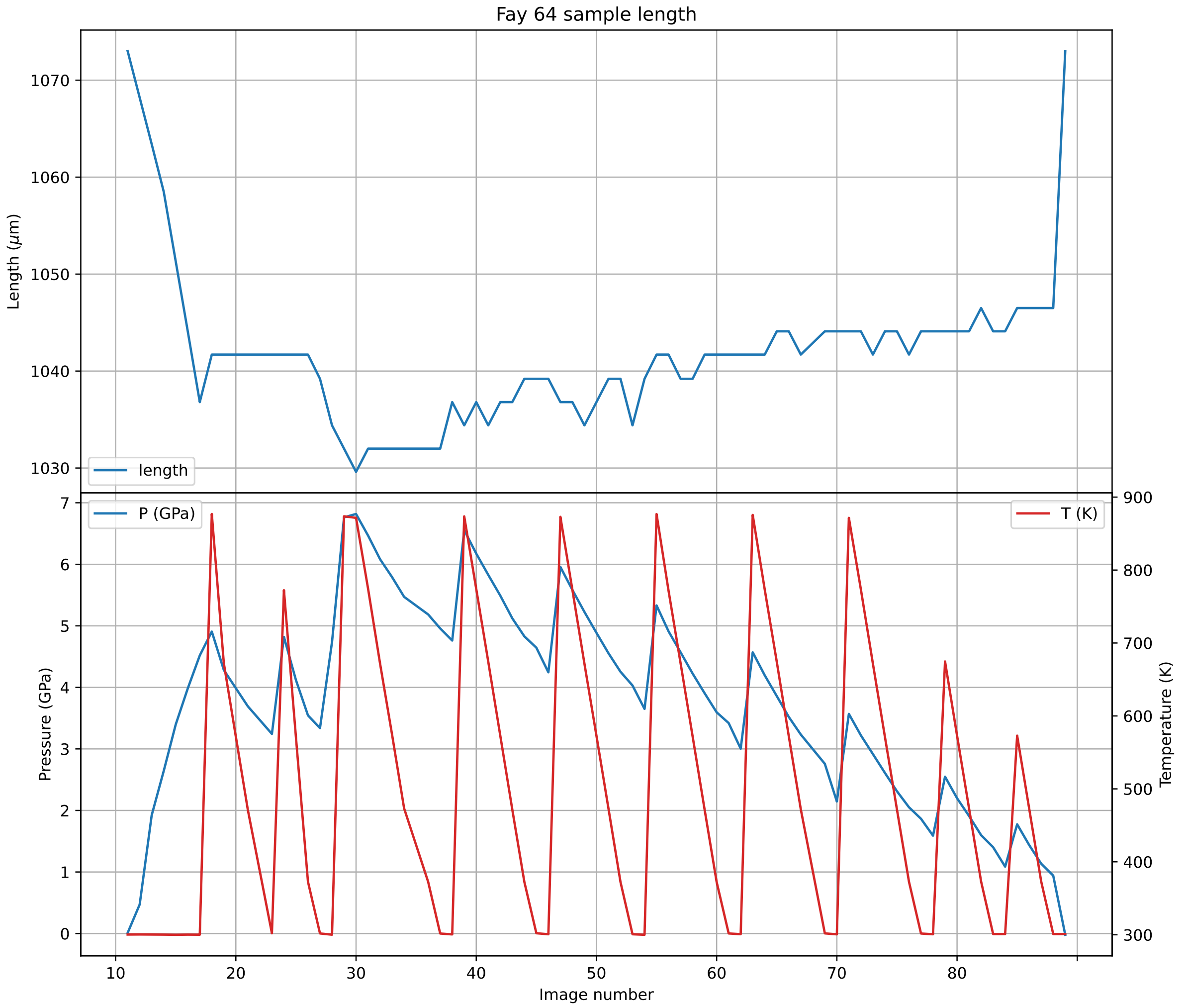

Figure S2. Top: Variation of the sample's length during the experiment. Bottom: Pressures (blue, left scale) and temperatures (red, right scale) of the experiment.

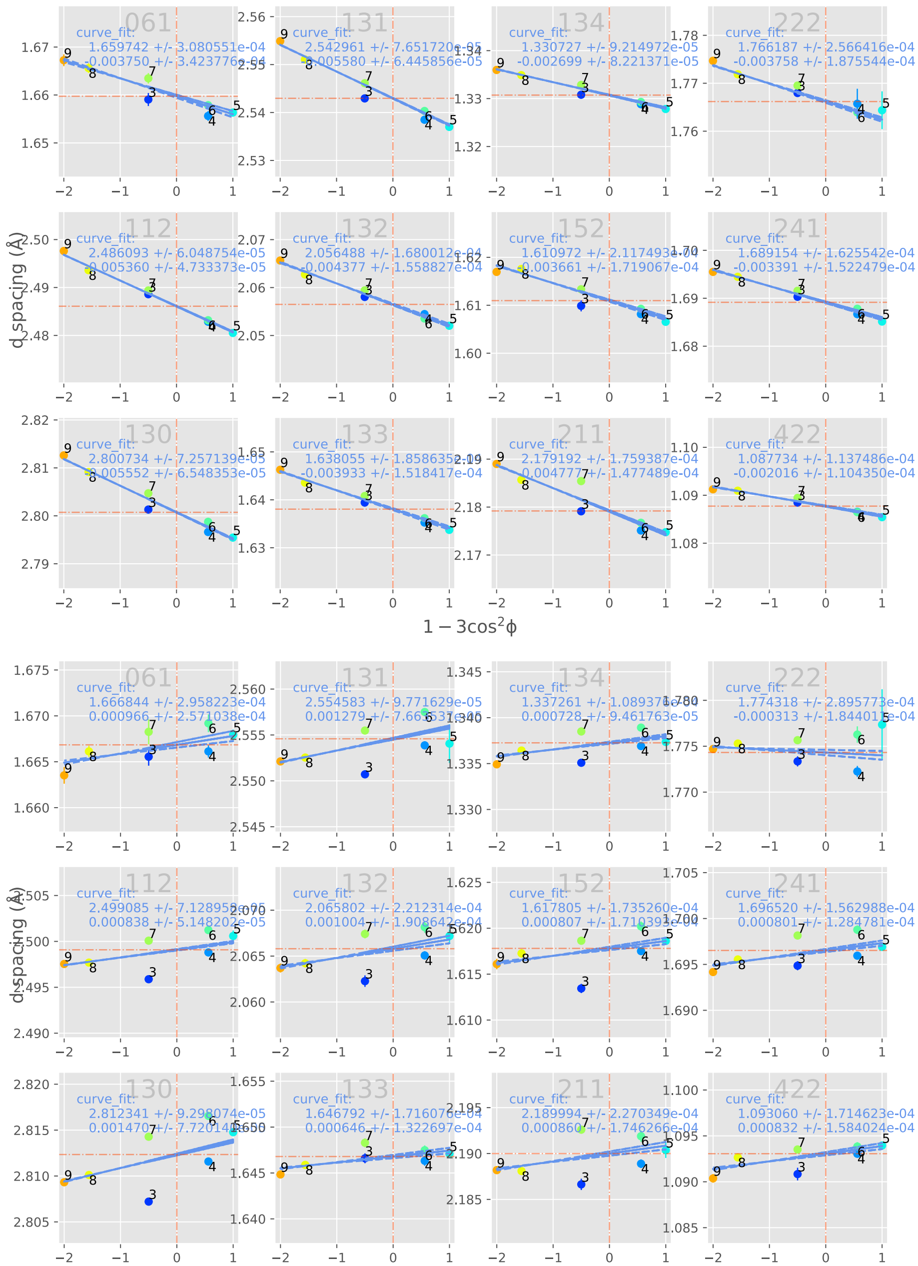

Figure S3. Two examples of measured d spacings as a function of $1-3\cos^2\psi$, ψ being the detector azimuth, for different hkl planes. These plots allow to calculate d spacings at hydrostatic pressure and differential stress. Top corresponds to diffractogram #26 and bottom to #104 in Table S1.

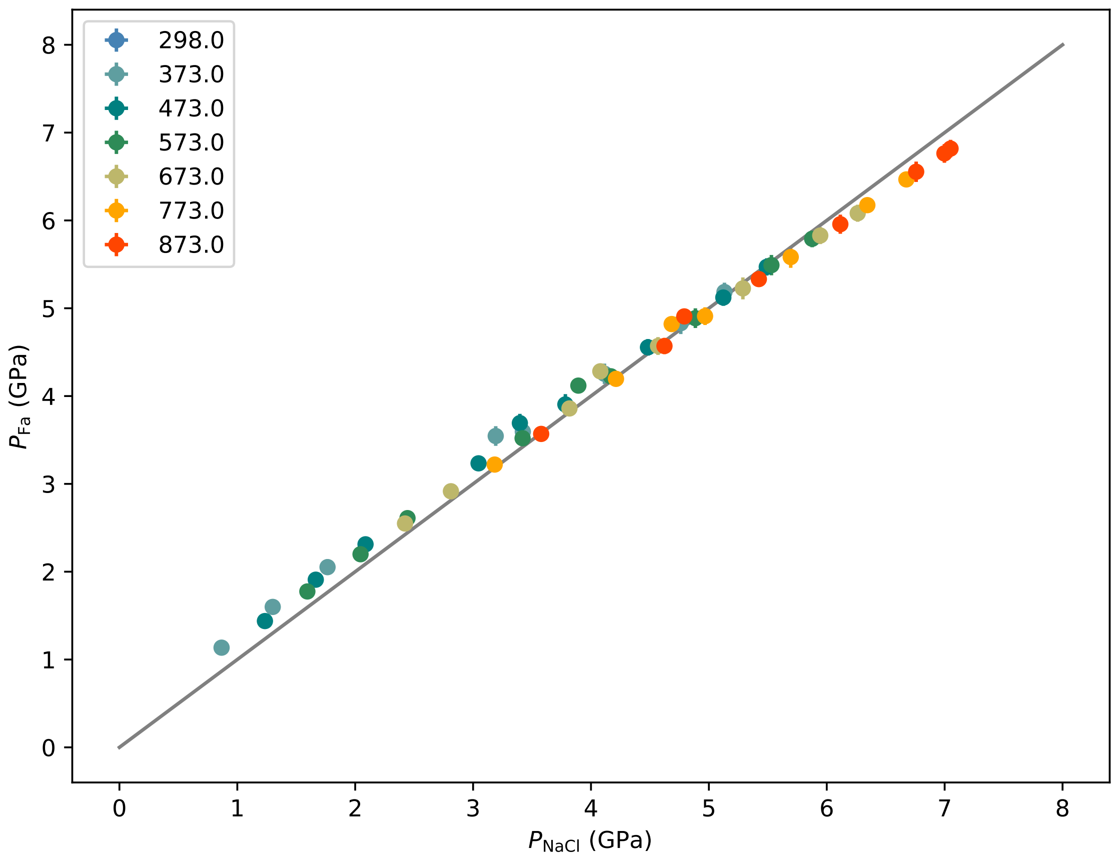

Figure S4. Fayalite pressure calculated from Eq. 3 as a function of pressure from NaCl unit-cell volumes. Grey line shows 1:1 ratio.

Table S1: Pressure and stress data obtained from X-ray diffraction on Fa and NaCl. P_{Fa} is corrected for differential stress following Eq. 3, P_{NaCl} is the pressure from Brown's EoS (1999), t_{Fa} and t_{nacl} are stresses calculated using the Singh's method (Singh et al., 1998). The # column is the Fa diffraction reference number.

#	P_{Fa} (GPa)	P_{NaCl} (GPa)	t_{NaCl} (GPa)	t_{Fa} (GPa)
20	4.91 ± 0.43	4.79 ± 0.37	-0.022 ± 0.014	-0.20 ± 0.05
22	4.28 ± 0.34	4.08 ± 0.27	-0.047 ± 0.014	-0.35 ± 0.06
24	3.69 ± 0.29	3.40 ± 0.20	-0.064 ± 0.031	-0.51 ± 0.06
26	3.24 ± 0.24	2.87 ± 0.15	-0.116 ± 0.027	-0.67 ± 0.06
28	4.82 ± 0.41	4.68 ± 0.34	0.058 ± 0.013	-0.15 ± 0.06
30	4.12 ± 0.32	3.89 ± 0.24	-0.033 ± 0.014	-0.37 ± 0.06
32	3.55 ± 0.27	3.19 ± 0.17	-0.068 ± 0.019	-0.60 ± 0.08
34	3.34 ± 0.27	2.96 ± 0.15	-0.126 ± 0.033	-0.70 ± 0.08
38	6.76 ± 0.65	7.00 ± 0.56	0.057 ± 0.013	0.41 ± 0.08
39	6.82 ± 0.65	7.05 ± 0.56	0.057 ± 0.015	0.40 ± 0.07
42	6.47 ± 0.56	6.68 ± 0.49	0.021 ± 0.013	0.33 ± 0.06
44	6.08 ± 0.51	6.26 ± 0.42	-0.013 ± 0.013	0.26 ± 0.07
46	5.79 ± 0.46	5.88 ± 0.37	-0.033 ± 0.018	0.10 ± 0.07
48	5.47 ± 0.41	5.49 ± 0.32	-0.047 ± 0.017	-0.02 ± 0.07
50	5.19 ± 0.37	5.13 ± 0.28	-0.073 ± 0.023	-0.15 ± 0.07
52	4.96 ± 0.34	4.87 ± 0.26	-0.092 ± 0.024	-0.23 ± 0.06
56	6.55 ± 0.64	6.76 ± 0.53	0.065 ± 0.012	0.37 ± 0.09
58	6.17 ± 0.54	6.34 ± 0.46	0.012 ± 0.015	0.27 ± 0.06
60	5.83 ± 0.49	5.94 ± 0.40	-0.025 ± 0.015	0.15 ± 0.07
62	5.49 ± 0.45	5.53 ± 0.35	-0.047 ± 0.016	0.01 ± 0.08
64	5.12 ± 0.38	5.12 ± 0.30	-0.074 ± 0.018	-0.07 ± 0.06
66	4.83 ± 0.37	4.76 ± 0.26	-0.085 ± 0.025	-0.19 ± 0.08
68	4.64 ± 0.33	4.53 ± 0.24	-0.103 ± 0.025	-0.28 ± 0.07
72	5.96 ± 0.58	6.12 ± 0.48	0.076 ± 0.016	0.31 ± 0.08
74	5.58 ± 0.51	5.69 ± 0.41	0.023 ± 0.011	0.19 ± 0.09
76	5.23 ± 0.46	5.29 ± 0.35	-0.021 ± 0.017	0.07 ± 0.09
78	4.89 ± 0.40	4.89 ± 0.30	-0.042 ± 0.020	-0.04 ± 0.08
80	4.55 ± 0.34	4.48 ± 0.26	-0.070 ± 0.014	-0.18 ± 0.07
82	4.25 ± 0.33	4.11 ± 0.22	-0.098 ± 0.023	-0.31 ± 0.08
84	4.03 ± 0.30	3.83 ± 0.20	-0.118 ± 0.025	-0.42 ± 0.07
88	5.33 ± 0.48	5.42 ± 0.42	0.057 ± 0.013	0.20 ± 0.05
90	4.91 ± 0.44	4.97 ± 0.36	0.012 ± 0.011	0.10 ± 0.08
92	4.57 ± 0.39	4.57 ± 0.30	-0.028 ± 0.023	-0.03 ± 0.06
94	4.22 ± 0.33	4.17 ± 0.26	-0.047 ± 0.017	-0.13 ± 0.05
96	3.90 ± 0.32	3.78 ± 0.22	-0.054 ± 0.015	-0.24 ± 0.09
98	3.60 ± 0.26	3.42 ± 0.19	-0.089 ± 0.021	-0.35 ± 0.05
100	3.42 ± 0.24	3.18 ± 0.16	-0.105 ± 0.028	-0.46 ± 0.05
104	4.57 ± 0.44	4.62 ± 0.36	0.050 ± 0.011	0.13 ± 0.07
106	4.20 ± 0.37	4.21 ± 0.30	-0.001 ± 0.013	0.02 ± 0.06
108	3.86 ± 0.31	3.82 ± 0.25	-0.020 ± 0.012	-0.08 ± 0.05
110	3.52 ± 0.28	3.42 ± 0.21	-0.034 ± 0.017	-0.18 ± 0.05
112	3.23 ± 0.25	3.05 ± 0.17	-0.046 ± 0.020	-0.33 ± 0.05
116	2.76 ± 0.20	2.46 ± 0.13	-0.075 ± 0.039	-0.53 ± 0.04

(To be continued)

#	P_{Fa} (GPa)	P_{NaCl} (GPa)	t_{NaCl} (GPa)	t_{Fa} (GPa)
120	3.57 ± 0.33	3.58 ± 0.27	0.050 ± 0.013	0.06 ± 0.05
122	3.22 ± 0.27	3.18 ± 0.22	0.004 ± 0.011	-0.05 ± 0.04
124	2.92 ± 0.22	2.81 ± 0.18	-0.012 ± 0.011	-0.17 ± 0.03
126	2.61 ± 0.20	2.44 ± 0.15	-0.024 ± 0.015	-0.27 ± 0.04
128	2.31 ± 0.18	2.09 ± 0.12	-0.045 ± 0.016	-0.38 ± 0.04
130	2.05 ± 0.17	1.77 ± 0.09	-0.067 ± 0.023	-0.50 ± 0.05
132	1.87 ± 0.15	1.53 ± 0.08	-0.091 ± 0.026	-0.59 ± 0.04
136	2.55 ± 0.22	2.42 ± 0.16	0.051 ± 0.011	-0.14 ± 0.05
138	2.20 ± 0.19	2.05 ± 0.12	-0.010 ± 0.010	-0.24 ± 0.05
140	1.91 ± 0.16	1.67 ± 0.09	-0.037 ± 0.021	-0.40 ± 0.05
142	1.60 ± 0.14	1.30 ± 0.07	-0.065 ± 0.017	-0.51 ± 0.05
144	1.40 ± 0.13	1.06 ± 0.05	-0.085 ± 0.023	-0.59 ± 0.05
148	1.78 ± 0.14	1.59 ± 0.10	0.042 ± 0.014	-0.23 ± 0.03
150	1.44 ± 0.13	1.23 ± 0.07	-0.032 ± 0.010	-0.34 ± 0.05
152	1.13 ± 0.10	0.87 ± 0.05	-0.077 ± 0.011	-0.48 ± 0.04
154	0.94 ± 0.12	0.62 ± 0.03	-0.102 ± 0.024	-0.58 ± 0.06
156	-0.02 ± 0.05	0.00 ± 0.00	0.024 ± 0.013	0.05 ± 0.04

References

Brown, J. M.: The NaCl pressure standard, J. Appl. Phys., 86, 5801–5808, 1999.

Singh, A., Balasingh, C., Mao, H.-k., Hemley, R., and Shu, J.: Analysis of lattice strains measured under nonhydrostatic pressure, J. Appl. Phys., 83, 7567–7575, 1998.