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**Supporting Information for**  
**Mechanical behavior and phase change of alkali-silica-reaction products under**  
**hydrostatic compression**

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**Solving lattice parameters from peak positions**

Assuming the angle  $\gamma$  to be  $90^\circ$ , the lattice parameters  $a$ ,  $b$ ,  $c$ ,  $\alpha$  and  $\beta$  were solved at each pressure value by solving the following equation using the *Mathematica* software.

$$V = abc\sqrt{1 - (\cos \alpha)^2 - (\cos \beta)^2}$$

$$d_{002} = V/(2ab)$$

$$d_{100} = V/(bc \sin \alpha)$$

$$d_{106} = V/\sqrt{b^2c^2 (\sin \alpha)^2 + 36a^2b^2 - 12ab^2c \cos \beta}$$

$$d_{121} = V/\sqrt{b^2c^2 (\sin \alpha)^2 + 4a^2c^2 (\sin \beta)^2 + a^2b^2 + 4abc^2 \cos \alpha \cos \beta - 4a^2bc \cos \alpha - 2ab^2c \cos \beta}$$

$$d_{\bar{1}22} = V/\sqrt{b^2c^2 (\sin \alpha)^2 + 4a^2c^2 (\sin \beta)^2 + 4a^2b^2 - 4abc^2 \cos \alpha \cos \beta - 8a^2bc \cos \alpha + 4ab^2c \cos \beta}$$

In the case of the lab-synthesized sample (SKC), the peak (025) is used instead of ( $\bar{1}22$ ).

Thus the corresponding equation is replaced with the following one.

$$d_{025} = V/\sqrt{4a^2c^2 (\sin \beta)^2 + 25a^2b^2 - 20a^2bc \cos \alpha}$$

### Peak position as a function of pressure

Table S1. Peak position as a function of pressure for Mels\_pore, Å.

P (GPa)	(002)	(100)	(106)	(121)	( $\bar{1}22$ )
0	12.15	6.619	3.592	2.934	2.822
0.96	11.81	6.599	3.571	2.925	2.809
2.31	10.35	6.601	3.566	2.920	2.810
3.56	10.12	6.573	3.544	2.901	2.793
4.84	9.97	6.541	3.518	2.892	2.775
6.18	9.81	6.499	3.493	2.872	2.762
7.36	9.65	6.461	3.468	2.857	2.742
8.72	9.49	6.438	3.439	2.846	2.727
1.98 (unload)	10.19	6.612	3.575	2.925	2.815

Table S2. Peak position as a function of pressure for ES1\_agg, Å.

P (GPa)	(002)_1	(002)_2	(100)_1	(100)_2	(106)_1	(106)_2	(121)	( $\bar{1}22$ )
0	12.16	10.62	6.604	6.489	3.587	3.509	2.925	2.819
0.93	11.88	10.60	6.596	6.445	3.563	3.498	2.920	2.807

2.00	11.57	10.52	6.584	6.405	3.550	3.489	2.920	2.800
3.10	10.17	10.42	6.575	6.363	3.539	3.481	2.911	2.791
4.20	10.02	10.38	6.563	6.327	3.525	3.475	2.900	2.778
5.37	9.95	10.33	6.544	6.293	3.505	3.464	2.887	2.766
6.30	9.85	10.31	6.516	6.252	3.495	3.458	2.876	2.754
7.50	9.71	10.27	6.493	6.216	3.462	3.439	2.865	2.742
1.65 (unload)	10.24	10.54	6.596	6.414	3.569	3.500	2.922	2.807

Table S3. Peak position as a function of pressure for ES1\_pore, Å.

P (GPa)	(002)_1	(002)_2	(100)_1	(100)_2	(106)_1	(106)_2	(121)	( $\bar{1}$ 22)
0	12.16	10.57	6.601	6.500	3.589	3.508	2.928	2.820
2.01	11.36	10.50	6.593	6.408	3.564	3.494	2.922	2.809
4.03	10.17	10.47	6.557	6.345	3.534	3.470	2.906	2.788
6.07	9.86	10.40	6.517	6.271	3.496	3.458	2.883	2.764
8.4	9.72	10.34	6.467	6.214	3.463	3.439	2.856	2.738
0.82 (unload)	10.34	10.52	6.623	6.470	3.587	3.501	2.937	2.813

Table S4. Peak position as a function of pressure for SKC, Å.

P (GPa)	(002)	(100)	(106)	(121)	(025)
0	13.27	6.473	3.521	3.049	2.928
0.99	13.10	6.445	3.470	3.036	2.904
2.20	12.91	6.412	3.456	3.026	2.879
3.03	12.74	6.324	3.450	3.021	2.869
4.17	12.62	6.276	3.448	3.009	2.858
5.17	12.51	6.244	3.444	3.000	2.844
6.07	12.46	6.211	3.440	2.984	2.829
7.36	12.35	6.160	3.430	2.969	2.810
1.6 (unload)	12.98	6.434	3.464	3.029	2.894