

SI Table 1. Acoustic velocities and densities in anhydrous and hydrous Rhyolitic Glasses. Estimated errors (1σ) are ± 0.10 GPa, ± 0.020 - 0.030 km/s, and ± 0.005 g/cm³ for pressure, velocity, and density measurements, respectively.

Pressure (GPa)	V_P (km/s)	V_S (km/s)	Density (g/cm ³)
Run 1-Ne			
Anhydrous (AHRG)			
Ambient	5.875	3.645	2.353
0.60	5.679	3.519	2.391
0.69	5.663	3.511	2.397
0.80	5.667	3.522	2.404
0.86	5.652	3.490	2.408
1.03	5.617	3.479	2.420
1.14	5.593	3.470	2.428
1.24	5.583	3.465	2.434
1.44	5.543	3.438	2.449
1.52	5.526	3.424	2.455
1.68	5.508	3.401	2.466
1.82	5.509	3.349	2.471
1.91	5.498	3.362	2.479
2.00	5.491	3.357	2.485
2.14	5.462	3.336	2.496
2.25	5.497	3.337	2.499
2.33	5.498	3.335	2.504
2.39	5.500	3.349	2.509
2.48	5.512	3.331	2.512
2.58	5.504	3.328	2.519
2.64	5.498	3.305	2.522
2.83	5.504	3.278	2.530
2.91	5.526	3.274	2.532
3.01	5.515	3.289	2.541
5.90 wt% H₂O_t (HRG-6)			
Ambient	5.550	3.319	2.270
0.60	5.450	3.232	2.308
0.69	5.458	3.220	2.313
0.80	5.449	-	-
0.86	5.437	3.220	2.325
1.03	5.440	3.211	2.335
1.14	5.408	3.199	2.343
1.24	5.363	3.204	2.352

1.44	5.378	3.155	2.362
1.52	5.390	3.202	2.369
1.68	5.391	3.171	2.377
1.82	5.421	3.173	2.384
1.91	5.422	3.167	2.389
2.00	5.411	3.168	2.396
2.14	5.406	3.151	2.404
2.25	5.450	3.199	2.410
2.33	5.462	3.171	2.412
2.39	5.477	3.201	2.416
2.48	5.480	3.191	2.420
2.58	5.481	3.178	2.425
2.64	5.490	3.181	2.429
2.83	5.542	3.207	2.436
2.91	5.558	3.212	2.439
3.01	5.561	3.197	2.444

Run 2-ME

Anhydrous (AHRG)

Ambient	5.810	-	-
0.65	5.689	-	-
0.77	5.647	-	-
0.86	5.611	-	-
1.00	5.620	-	-
1.22	5.596	-	-
1.37	5.561	-	-
1.60	5.508	-	-
1.75	5.496	-	-
1.95	5.483	-	-
2.08	5.471	-	-
2.24	5.523	-	-
2.45	5.472	-	-
2.64	5.482	-	-
2.84	5.469	-	-
3.04	5.507	-	-

5.90 wt% H₂O_t (HRG-6)

Ambient	5.491	-	-
0.65	5.459	-	-
0.77	5.422	-	-
0.86	5.414	-	-
1.00	5.413	-	-
1.22	5.405	-	-

1.37	5.393	-	-
1.60	5.381	-	-
1.75	5.383	-	-
1.95	5.398	-	-
2.08	5.438	-	-
2.24	5.452	-	-
2.45	5.464	-	-
2.64	5.449	-	-
2.84	5.489	-	-
3.04	5.518	-	-
<hr/>			
Run 3-Ne			
<hr/>			
3.28 wt% H₂O_t (HRG-3)			
<hr/>			
Ambient	5.605	3.396	2.318
0.11	5.578	3.388	2.325
0.21	5.537	3.359	2.331
0.37	5.508	3.327	2.342
0.55	5.488	3.319	2.354
0.74	5.444	3.296	2.367
0.87	5.440	3.235	2.374
0.97	5.434	3.235	2.380
1.14	5.410	3.246	2.393
1.22	5.366	3.272	2.402
1.33	5.426	3.251	2.405
1.40	5.458	3.237	2.407
1.54	5.383	3.212	2.419
1.69	5.416	3.239	2.428
1.79	5.410	3.179	2.431
1.91	5.384	3.197	2.442
2.02	5.407	3.193	2.447
2.11	5.405	3.231	2.456
2.31	5.427	3.099	2.457
2.45	5.433	3.085	2.464
2.56	5.448	3.122	2.471
2.72	5.452	3.149	2.483
2.90	5.450	3.192	2.498
3.01	5.444	3.130	2.500

SI Table 2. Species abundances of OH⁻ and H₂O_m at different pressures. Values in parentheses are standard deviations from FTIR measurements.

Sample	Pressure (GPa)	OH⁻ (wt%)	H₂O_m (wt%)
HRG-3 (FTIR-Run 2)	0.0001	1.58 (6)	1.7 (7)
	0.14	1.55 (6)	1.73 (7)
	0.28	1.54 (6)	1.74 (7)
	0.42	1.56 (6)	1.73 (7)
	0.69	1.55 (6)	1.73 (7)
	1	1.52 (6)	1.76 (7)
	1.22	1.54 (6)	1.74 (7)
	1.44	1.48 (6)	1.8 (7)
HRG-6 (FTIR-Run 1)	0.0001	1.67 (9)	4.23 (17)
	0.0001	1.74 (21)	4.20 (39)
	0.18	1.86 (23)	4.03 (37)
	1	2.12 (25)	3.61 (34)
	1.76	2.36 (41)	3.43 (64)
	2.27	2.10 (28)	3.94 (32)
	2.84	2.56 (44)	3.55 (67)