Saubin, E., Kennedy, B., Tuffen, H., Nichols, A.R.L., Villeneuve, M., Bindeman, I., Mortensen, A., Schipper, C.I., Wadsworth, F.B., Watson, T., and Zierenberg, R., 2020, Textural and geochemical window into the IDDP-1 rhyolitic melt, Krafla, Iceland, and its reaction to drilling: GSA Bulletin, <https://doi.org/10.1130/B35598.1>.

Supplemental Material

Table.

Figure S1. Time evolution of drilling parameters during the third magma interception by the IDDP-1 well over the total duration of recovery (15:15–00:50). In blue are the parameters referring to the drill bit (RPM, the rotation per minute; ROP, the rate of penetration; Torque, the resistance to rotation). In red are the parameters that can inform the conditions and properties at depth (Temperature differential of drilling fluids in and out of the well, Standpipe pressure, Loss of drilling fluids circulation). The height of the topdrive informs the up and down movements of the drill bit, associated with WOB, the weight put on the bit at the surface.

Figure S2. Correspondence between categories of vesicularity estimated using a visual reference chart (y-axis), and 2D vesicularity calculated with the ImageJ software on processed BSE images (x-axis). Among the 26 data points, many are overlapping. Red crosses represent the missorted particles, 3 out of 26, resulting in a ~12% overall variation in classification.

Figure S3. TGA (green) and dTGA (black) curves from dehydration experiments on IDDP-1 glass. The TGA curve shows a total mass loss of ~1.86 wt%. The dTGA curve indicates that the vast majority of mass loss occurred over the temperature interval 600–1000 °C. This corresponds to the high-temperature diffusive loss of magmatic water, as opposed to lower temperature loss of water added via secondary hydration (Denton et al., 2009; Giachetti et al., 2015). The dTGA peaks, which occur at 737 °C and 863 °C, exactly match the H₂O signal as determined by the mass spectrometer, indicating that the vast majority of the exsolved volatile phase is H₂O. The origin of the two pulses of H₂O loss is unclear but may reflect diffusive loss from the matrix (broader, lower temperature peak), followed by more abrupt H₂O release from melt inclusions during phenocryst resorption. The measured patterns of volatile release indicate that low-temperature hydration was insignificant, and thus that the volatile concentrations indicate magmatic volatile species at magmatic temperatures.

Figure S4. Example of the various vesicle textures shown in BSE images. (A) Vesicles are distributed in lines around crystals. This brown glass with >3% vesicularity was retrieved at 19:45. (B) Variation in vesicles elongation within one single clear glass, retrieved at 23:00, with > % vesicles. (C) Example of multiple bubble populations in a single clast. Some elongated vesicles have torpedo shapes. The clear glass has >3% vesicularity, sampled at 16:00 (data on vesicles distribution are in Supplementary Material, data spreadsheet). (D) Same image than in D, processed for analyses of vesicles using FOAMS software Digital Material S5. Reconstruction in 3D of representative clasts retrieved from the IDDP-1 well. Videos show the external and internal textures of clasts, with highlight on the mafic crystal populations and

dispersion. Glass is in blue color, titanomagnetite in light green, augite in dark green, and empty spaces (cracks and vesicles) are in black. The poorly vesicular clear glass was retrieved at 16:30. The poorly vesicular brown glass and crystalline felsite, and the vesicular glassy felsite, were retrieved at 17:30. Long axis of particles is ~1 mm.

Digital Material S5-1. Reconstruction in 3D of poorly vesicular brown glass, retrieved at 17:30 from the IDDP-1 well. Video shows the external and internal textures, highlighting the mafic crystal populations. Glass is in blue, titanomagnetite is in light green, augite is in dark green, empty space (cracks and vesicles) are in black. Long axis of particle is ~1 mm.

Digital Material S5-2. Reconstruction in 3D of poorly vesicular clear glass, retrieved at 16:30 from the IDDP-1 well. Video shows the external and internal textures, highlighting the mafic crystal populations. Glass is in blue, titanomagnetite is in light green, augite is in dark green, empty space (cracks and vesicles) are in black. Long axis of particle is ~1 mm.

Digital Material S5-3. Reconstruction in 3D of vesicular glassy felsite, retrieved at 17:30 from the IDDP-1 well. Video shows the external and internal textures, highlighting the mafic crystal populations. Glass is in blue, titanomagnetite is in light green, augite is in dark green, empty space (cracks and vesicles) are in black. Long axis of particle is ~1 mm.

Digital Material S5-4. Reconstruction in 3D of crystalline felsite, retrieved at 17:30 from the IDDP-1 well. Video shows the external and internal textures, highlighting the mafic crystal populations. Glass is in blue, titanomagnetite is in light green, augite is in dark green, empty space (cracks and vesicles) are in black. Long axis of particle is ~1 mm.

TG /%

DTG /(%/min)