**Table S1:** Petrologic descriptions of Rock samples from Askja caldera

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| **Fig. ID** | **Location** | **Class #** | **Rock type** | **Texture** | **Colorization** | **Primary/secondary mineral content** | **Literature** | **Formation** |
| B4 | fumarolic area | Class 7 | mixed pumice: rhyolitic pumice with mafic enclaves | brittle+friable clasts, light and glassy with large (cm-sized) vesicles | light gray+dark gray, yellowish-brown | rhyolitic+basaltic glass/ palagonite, <5%phenocrysts: plagioclase, clinopyroxene, hypersthene, magnetite, apatite/clay, chlorite (respectively iddingsite), serpentine, Fe-oxides/-hydroxides | Sparks et al., 1977; Sigurdsson and Sparks, 1978a | 1875 pumice |
| B5 | fumarolic area | Class 7 | rhyolitic pumice | brittle+friable clasts, light and glassy with large (cm-sized) vesicles | light gray, yellowish-orange alteration | rhyolitic glass/ palagonite, <5%phenocrysts: plagioclase, clinopyroxene, hypersthene, magnetite, apatite | Sparks et al., 1977; Sigurdsson and Sparks, 1978a | 1875 pumice |
| D2 | fumarolic area | Class 2 | rhyolitic pumice | friable clasts, light and glassy with large (cm-sized) vesicles | light gray, yellowish-orange alteration | rhyolitic glass/ palagonite, <5%phenocrysts: plagioclase, clinopyroxene, hypersthene, magnetite, apatite | Sparks et al., 1977; Sigurdsson and Sparks, 1978a | 1875 pumice |
| D5 | fumarolic area | Class 2 | Fe-oxide coated mixed pumice: rhyolitic pumice with mafic enclaves | hard friable clasts, light and glassy with large (cm-sized) vesicles | light gray+dark-gray, with red-brown coating | rhyolitic+basaltic glass/ palagonite, <5%phenocrysts: plagioclase, clinopyroxene, hypersthene, magnetite, apatite | Sparks et al., 1977; Sigurdsson and Sparks, 1978a | 1875 pumice |
| D3+  D4 | fumarolic area | Class 2 | clayrich colored rhyolitic gray pumice | soft+friable clasts, light and glassy with large (cm-sized) vesicles | light gray, yellowish-brown | rhyolitic glass/ palagonite, <5%phenocrysts: plagioclase, clinopyroxene, hypersthene, magnetite, apatite | Sparks et al., 1977; Sigurdsson and Sparks, 1978a | 1875 pumice |
| A3 | fumarolic area | Class 3 | black pumice, basaltic lava flow or scoria | non-friable hard, heavy and dense clast with differently sized phenocrysts (mm- and cm-sized) | black, dark brown coatings | glassy basalt, phenocrysts: pyroxenes, olivines, feldspars in matrix/ serpentine, chlorite | Hartley and Thordarsson 2013 | Askja 20th century basalts |
| B1 | fumarolic area | Class 7 | mixed pumice: rhyolitic + mafic | brittle+friable clasts, light and glassy with small (mm-sized) vesicles | light-gray to blackish | rhyolitic+basaltic glass, phenocrysts: pyroxenes, olivines, feldspars / iron and magnesium oxides | Sparks et al., 1977; Sigurdsson and Sparks, 1978a | 1875 pumice |
| B2 | fumarolic area | Class 7 | mixed pumice: rhyolitic + mafic | brittle+friable clasts, light and glassy with small (mm-sized) vesicles | medium-gray to blackish | rhyolitic+basaltic glass, phenocrysts: pyroxenes, olivines, feldspars / iron and magnesium oxides | Sparks et al., 1977; Sigurdsson and Sparks, 1978a | 1875 pumice |
| B3 | fumarolic area | Class 7 | clay-rich rhyolitic pumice | soft & friable clasts, slightly more heavy and more dense than rhyol.gray pumice | light gray to yellowish-orange | rhyolitic glass/ mostly clay and palagonite | Sparks et al., 1977; Sigurdsson and Sparks, 1978a | 1875 pumice |
| D6 | fumarolic area | Class 2 | Fe-coated obsidian, lapilli impregnated with red-brown iron oxides | non-friable clasts, light and glassy with small (mm-sized) vesicles | light gray to pale-brown with red oxide coatings | obsidian? glass with mm-sized phenocrysts of feldspar and pyroxene/ palagonite, clay, iron oxides | Sparks et al., 1977; Sigurdsson and Sparks, 1978a | 1875 pumice |
| A2 | landslide area | Class 3 | basaltic lava (glassy crust of a flow, or scoria) | hard+heavy, glassy partially crystallized crust with up to cm-sized vesicles and flow structures | blackish | basaltic glass with phenocrysts: plagioclase, clinopyroxenes, olivines, Ti-Fe-oxides/ serpentine, chlorite, clay, iron oxide coating and impregnation | Hartley and Thordarsson 2013 | Askja 20th century basalts |
| A1 | landslide area | Class 6 | oxidized basaltic lava from flow or pillow breccia with reddish oxide coating | hard+dense rock with vesicles and flow structures | blackish with reddish coating | basaltic glass with phenocrysts: plagioclase, clinopyroxenes, olivines, Ti-Fe-oxides/ serpentine, chlorite, clay, iron oxide coating and impregnation | Hartley and Thordarsson 2013 | Askja 20th century basalts |
| D1 | landslide area | Class 4 | strongly altered and bleached tuff (hyaloclastite) impregnated with pinkish, reddish to yellowish-brown iron oxides | soft+porous but comparatively dense material | light-gray to whitish porous groundmass with red oxide coating | ??/ sulfate, gypsum, carbonate, clay, iron and magnesium oxides |  | hydrothermal replacement deposit |
| C1 | landslide area | Class 2 | strongly altered rhyolite dike (banded compacted pumice/hyaloclastite) with quartz-filled fractures | very dense fully crystallized magmatic/volcanic rock without vesicles | pale-brown to yellowish-orange | altered rhyolite glass, phenocrysts: pyroxenes, olivines, feldspars/ clays, oxide coatings and impregnation | Graettinger 2012; | prehistoric rhyolite dome |
| C3 | landslide area | Class 5 | brecciated hyaloclastite (pillow lava breccia?) with healed Calcite-filled fractures | hard+dense fractured/brecciated rock | medium to dark-gray with greenish and pale-brown alteration | basaltic glass, phenocrysts: plagioclase, clinopyroxenes, olivines, Ti-Fe-oxides/ serpentine, chlorite, clay, iron oxide coating and impregnation | Graettinger 2012; | prehistoric subaequous basalts |
| C2 | landslide area | Class 5 | hyaloclastite or tuff? with greenish alteration minerals | hard+dense piece with small (mm-sized) vesicles | dark-gray to greenish | glassy basaltic matrix , phenocrysts: plagioclase, clinopyroxenes, olivines, Ti-Fe-oxides/ serpentinite, chlorite, epidote, clay | Graettinger 2012; | prehistoric subaequous basalts |