

SAMPLE: MAC 37 626110 106.9m

SUMMARY: This sample is a formerly glassy sparsely plagioclase-phyric rhyolitic lava with a weak silica-sericite-leucoxene alteration due to pervasive burial metamorphic degradation.

HAND SPECIMEN:

This is a massive grey-green, very fine-grained, probably originally glassy felsic lava with sericite alteration and quartz-sericite healed fractures.

THIN SECTION DESCRIPTION:

This sample is clearly a formerly glassy sparsely plagioclase-phyric dacitic to rhyolitic lava. Totally sericitized plagioclase phenocrysts make up around 5 modal% maximum of this rock, and are rarely longer than 1mm. There were no mafic phenocrysts in this rock, but one distinct slightly rounded and resorbed quartz phenocrysts is present. Leucoxene-altered FeTi oxides are not uncommon as small phenocrysts. A few apatite phenocrysts were also noted in this sample.

The formerly glassy groundmass of this lava has devitrified and recrystallized as a relatively fine-grained snowflake (micropoikilitic) textured intergrowth composed of quartz and feldspar, the latter being replaced by very fine-grained sericite. Occasional anhedral grains of quartz are growing from the recrystallized groundmass, and local concentrations of sericite fill fractures and tension gashes. In several areas, more abundant quartz has grown from the groundmass and now is immersed in dirty brown calcite.

This was probably a glassy rhyolitic lava; it has suffered only low-grade regional burial-related recrystallization and degradation.

SAMPLE: MAC 37 626111

164.0 m

SUMMARY: This sample was an andesitic monomict glassy lava breccia that shows strong chlorite-silica±sericite hydrothermal alteration.

HAND SPECIMEN:

This is a grey-green andesitic monomict lava breccia with strong alteration of the inter-fragment matrix. Maximum clast size is about 3cm, although most are much smaller.

THIN SECTION DESCRIPTION:

This sample is a strongly altered intermediate lava breccia in which the fragmental texture is better seen in the hand specimen of core than in the thin section. The most obvious fragments are distinct because they are more abundantly chloritic than the remainder of the rock. The protolith was probably a moderately plagioclase-phyric andesitic rock with subordinate augite phenocrysts and quite common FeTi oxide phenocrysts. The latter are altered to leucoxenic aggregates, and former augite crystals are replaced by chlorite. All plagioclase phenocrysts are totally replaced by sericite and dirty calcite. The groundmass of the fragments was composed of glass, but has strongly altered to a chloritic intergrowth with overprinting patchy calcite.

The fragments of chloritic lava are separated from each other by broad zones that are far less chloritic and more quartz-rich, and which show a weak sericite-defined foliation. Patchy calcite also occurs in this inter-fragment matrix, which I assume was originally composed of comminuted material, dominantly glassy, of the same composition as the fragments themselves. The more porous and reactive nature of the matrix is responsible for its far more extensive alteration compared to the fragments themselves.

The alteration shown by this sample is almost certainly of local hydrothermal origin, resulting from hot fluids moving mainly through the porous inter-fragment matrix, but also 'cooking up' the larger fragments in the rock, chloritizing the glassy groundmass and depositing excess silica in the more altered matrix.

SAMPLE: MAC 37 626112 279.0m

SUMMARY: This sample is a quite strongly sericite-carbonate ±pyrite hydrothermally altered epiclastic fine conglomerate derived from a mainly felsic volcanic source.

HAND SPECIMEN:

This is a grey epiclastic conglomerate with felsic(?) lava clasts to at least 1cm across, some of which are subrounded and fractured.

THIN SECTION DESCRIPTION:

This sample is strongly altered coarse-grained epiclastic sedimentary rock derived entirely from felsic volcanics. A diversity of clasts are present, most around 3-5mm long, and many show evidence of mechanical rounding and abrasion. Two well-represented lithic clast types are formerly glassy almost aphanitic rhyolitic or dacitic lava clasts now composed of a mosaic intergrowth dominated by quartz and subordinate feldspar; the second type appears to be clasts of a finer-grained epiclastic sandstone in which detrital grains include angular quartz and albite set in a matrix that has probably crystallized from devitrified very fine-grained vitric ash. The same material probably formed matrix to the entire sample, which is now heavily carbonate-sericite-altered. Well-formed small crystals of pyrite are present disseminated throughout the sample, but are not volumetrically significant. Some of the calcite dispersed through this sample appears to be primary detrital calcite, and at least one clast seems to be a crystalline limestone.

This rock is an epiclastic conglomerate, probably a mass-flow unit, derived from a felsic volcanic - volcanoclastic source in which glassy lavas and vitric ash formed a significant component. The rock has been strongly sericite-carbonate±pyrite altered in a hydrothermal alteration system.

SAMPLE: MAC 37 626113

311.1m

SUMMARY: This sample is a strongly hydrothermally altered (sericite-calcite), formerly glassy, almost aphyric felsic lava.

HAND SPECIMEN:

This is a massive, unfoliated, pale pinkish-grey very strongly-altered felsic lava that appears to have been aphyric.

THIN SECTION DESCRIPTION:

This sample is an intensely altered formerly glassy felsic lava that contained a few phenocrysts of plagioclase and FeTi oxide, and possibly also a few small augite phenocrysts. The former plagioclase phenocrysts have been totally replaced by sericite and calcite, and the FeTi oxides by leucoxene. A few small chlorite-dominated spots lacking good crystal form may have been augite.

The groundmass of this lava was originally glassy. Despite the strong overprinting alteration, there is good evidence preserved in places that the groundmass before hydrothermal alteration consisted of a relatively fine-grained snowflake-textured quartzo-feldspathic material derived from devitrified glass. Intense calcite-sericite alteration pervades this rock, and almost all the groundmass is now composed of a rather messy intergrowth of dusty calcite and very fine-grained sericite, with not uncommon small patches of green chlorite. Clearer patches are discontinuous blebs and streaks of polycrystalline secondary quartz.

This was a virtually aphyric felsic (dacitic to rhyolitic) glassy lava.

SAMPLE: MAC 37 626114 382.5m

SUMMARY: This sample is a very sparsely plagioclase-phyric formerly vitrophyric-textured andesitic lava with a moderate hydrothermal alteration assemblage dominated by calcite and sericite. .

HAND SPECIMEN:

This is a massive, featureless grey almost aphyric andesitic lava.

THIN SECTION DESCRIPTION:

This sample is a sparsely plagioclase-phyric andesitic lava in which the few modal% of small plagioclase phenocrysts are totally sericitized. Occasional FeTi oxide microphenocrysts are always replaced by small granules of sphene set in murky brown leucoxenitic material.

The remainder of this rock was probably a vitrophyric-textured intergrowth of small plagioclase laths and FeTi oxide granules in glass. The groundmass glass devitrified then recrystallized to a messy intergrowth of ragged quartz, sericitized anhedral plagioclase, minor chlorite, all overprinted by abundant fairly fine-grained carbonate. Occasional anhedral grains of quartz are growing from the altered groundmass.

SAMPLE: MAC 37 626115

426.9m

SUMMARY: This sample is a burial metamorphosed massive, formerly glassy sparsely plagioclase-phyric felsic rock, which logging data indicates is from an intrusive body.

HAND SPECIMEN:

This is a pinkish-grey aphyric felsic lava(?) that was probably largely glassy.

THIN SECTION DESCRIPTION:

This sample is a formerly glassy very sparsely plagioclase-phyric felsic intrusive. The few former plagioclase phenocrysts are less than 1mm long, and are totally replaced by fine-grained sericite. A few small leucoxene-altered FeTi oxides are present, and several grains of apatite and zircon were noted.

The bulk of this sample consists of quartzo-feldspathic mainly fine-grained aggregates after glass. Different textural domains exist in the sample, the most common being composed of very fine-grained quartz and sericitized feldspar, with streaks of sericite cross-cutting this material. In more strongly recrystallized domains, quartz occurs as coarser-grained anhedral crystals separated by meshworks of sericite that are more intensely developed than in the finer-grained domains.

This was a massive homogeneous almost aphyric glassy felsic rock, and the alteration assemblage and textures reflect regional burial metamorphic degradation. There is simply no way I could have told you that this was an intrusive rock from the thin section alone. The weaker alteration of this relative to some adjacent samples might indicate that it is from a massive, relatively impervious unit, but only your logging can tell that this is an intrusive unit.

SAMPLE: MAC 37 626116

524.5 m

SUMMARY: This sample is a strongly hydrothermally altered (sericite-carbonate) formerly plagioclase-phyric andesitic lava.

HAND SPECIMEN:

This is a mid-grey quite strongly altered plagioclase-phyric andesitic lava.

THIN SECTION DESCRIPTION:

This sample is a weakly foliated formerly quite plagioclase-phyric andesitic lava with strong sericite-carbonate alteration. Former plagioclase phenocrysts make up around 12-15 modal% of the rock, and are both heavily sericitized and rather stretched and deformed. Most were probably in the range 1-2mm long. A few small stretched chloritic aggregates may have been former augite phenocrysts, and the former FeTi oxides are leucoxene-altered.

The groundmass texture of this andesitic lava is difficult to determine with certainty due to the heavy alteration overprint. It may have been glassy to vitrophyric. Now, the groundmass consists of a dense calcite-sericite intergrowth, with sericite defining a weak cleavage. Chloritic specks are common interspersed through the sericite-calcite and tiny granules and occasional disseminated larger euhedral crystals of pyrite are common. Blebs of quartz are not uncommon growing from the altered groundmass, and some have shapes that are almost euhedral, despite the clearly polycrystalline, secondary nature of these grains. Microshears defined by intense sericite-chlorite development are common, and a few calcite veinlets cut the rock.

SAMPLE: MAC 37 626117

662.4m

SUMMARY: This sample is an augite+plagioclase-phyric mafic andesite or evolved basaltic lava that has suffered mild hydrothermal alteration, with the alteration assemblage dominated by epidote and quartz.

HAND SPECIMEN:

This is a massive grey-green plagioclase+mafic-phyric andesitic lava.

THIN SECTION DESCRIPTION:

This sample is a texturally fairly well-preserved augite+plagioclase-phyric mafic andesite or even evolved basaltic lava composition. Former plagioclase phenocrysts to around 3mm maximum length (usually much smaller) make up around 3-5 modal% of this sample, and are always totally replaced by extremely fine-grained messy epidote. More abundant (7-10 modal%) are small euhedral augite phenocrysts that often occur as clots of 4 or 5 crystals. These are usually fresh, although often fractured, and occasional crystals are replaced partly or totally by chlorite. Surprisingly, there are effectively no FeTi oxides in this sample, although it is hard to rule out that they were leached away during recrystallization of the formerly glassy groundmass.

The groundmass of this sample was a very fine-grained vitrophyric intergrowth of tiny plagioclase microlites and laths in glass. The glass has devitrified, and crystallized to a very fine-grained quartzo-feldspathic material in which common anhedral to rather rounded blebs of secondary quartz have grown. Angular patches of chlorite are not uncommon in the groundmass, but it is almost colourless. Streaks and patches of the same very fine-grained epidote are common throughout the groundmass. Several clots composed of rather coarse-grained epidote intergrown with colourless chlorite and minor pyrite(?) are present, but their origin it is not obvious. I don't believe that they replace crystal clots of plagioclase and/or augite; rather they may be cross-sections of small flow channelways. Supporting this, several coarse-grained epidote veinlets transect the sample.

SAMPLE: MAC 37 626118

736.4m

SUMMARY: This sample is a low-grade burial metamorphosed augite+plagioclase-phyric basaltic lava. .

HAND SPECIMEN:

This is a massive dark green rather coarse-grained mafic lava, or a doleritic intrusive rock. Large augite plates to 5mm across are common, and spotty chlorite-epidote alteration and calcite veins are also present..

THIN SECTION DESCRIPTION:

This sample is a texturally well-preserved quite porphyritic mafic lava. Fresh fractured augite phenocrysts to about 4-5mm across make up about 5 -8 mdaol% of this sample, and often occur as intergrowths of 3 or 4 crystals. Less obvious due to strong epidote alteration, but nevertheless not uncommon, are 1-3mm-sized former euhedral plagioclase phenocrysts that now consist of albite, quartz and yellow epidote. Chloritic patches with occasional crystal shapes may be altered olivine phenocrysts, although these are not common. FeTi oxides in this sample were unusually scarce and small; all have altered to leucoxene.

The groundmass of this lava was a largely crystalline intergrowth of small plagioclase laths, less abundant small, equidimensional augite plates, and FeTi oxide granules. Alteration of this assemblage and minor interstitial glassy mesostasis has produced spots of quartz, chlorite, epidote and leucoxene throughout the groundmass.

This sample was a typical augite+plagioclase-phyric, rather well-preserved basaltic lava with a low-grade (prehnite-pumpellyite facies) burial metamorphic alteration assemblage.

SAMPLE: MAC 37 626119

826.3m

SUMMARY: This sample is a quenched lava breccia or hyaloclastite derived from a quite primitive olivine+augite-phyric vesicular basaltic lava similar to the Hellyer basalt.

HAND SPECIMEN:

This is a grey hyaloclastitic lava or lava breccia probably of intermediate to mafic composition. Most fragments are sparsely vesicular and less than 1cm long, but several are larger than 6 cm across.

THIN SECTION DESCRIPTION:

This sample is composed of fragments of quite strongly but finely vesicular olivine+augite-phyric rather primitive basaltic lava. Former olivine phenocrysts make up around 5 modal% of the rock and are totally altered to a fine-grained quartz aggregate; many contain small euhedral chromite inclusions. Similarly abundant, but generally larger (to about 3mm long) are fresh euhedral augite phenocrysts that show compositional zoning. No plagioclase phenocrysts were present in this primitive basaltic lava breccia. The groundmass of the lava fragments was largely glassy, with tiny plagioclase microlites. Glass has devitrified to an exceptionally fine-grained, almost isotropic quartz-feldspar aggregate; small blebs of secondary quartz are growing from this groundmass. Rounded vesicles are filled by quartz and chlorite.

The matrix between lava fragments is composed of a very heterogeneous and variably-textured messy intergrowth dominated by epidote and quartz, with occasional patches of chalcedonic silica, pumpellyite and prehnite, and chlorite.

This is clearly a vesicular basaltic lava breccia with strong similarities to more quenched units of the Hellyer basalt. It shows a burial metamorphic alteration assemblage.