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Samples: 52584 - 52588

Summary:

Sample 52584 is a medium grained, slightly porphyritic, potassic diorite dominated by plagioclase with much less biotite, epidote, and K-feldspar, and with minor sphene. It was deformed and recrystallized slightly.

Sample 52585 is a medium grained, granodiorite dominated by plagioclase with less quartz and K-feldspar, and much less epidote and biotite. Major accessory minerals are sphene and magnetite. It was sheared and recrystallized slightly; quartz was recrystallized most strongly, and sericite-rich seams were formed.

Sample 52586 is a porphyritic diorite containing phenocrysts of plagioclase in a very fine to fine grained groundmass dominated by plagioclase, with much less hornblende, epidote and chlorite. Textures suggest that the rock was metamorphosed and recrystallized slightly.

Sample 52587 contains bands of amphibolite dominated by hornblende and plagioclase and a large felsic-rich band, possibly formed by metamorphic segregation, dominated by plagioclase with much less hornblende, epidote, and chlorite. A replacement band in the felsic-rich layer is dominated by epidote. Accessory minerals include sphene, apatite, and pyrite.

Sample 52588 is a well foliated, metamorphosed latite tuff containing plagioclase grains in a groundmass of muscovite. A few layers contain coarser grained detrital plagioclase. At one end, plagioclase is coarser grained. Minor minerals include apatite, pyrite, and Ti-oxide. Accessory minerals include zircon and scheelite.

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The rock is a medium grained, slightly porphyritic, potassic diorite dominated by plagioclase with much less biotite, epidote, and K-feldspar, and with minor sphene. It was deformed and recrystallized slightly.

plagioclase	60-65%
epidote	15-17
biotite	12-15
K-feldspar	5- 7
amphibole	2- 3
sphene	1
quartz	0.3
apatite	0.1
chalcopyrite	minor
pyrite	trace
ilmenite	trace

Plagioclase forms anhedral grains averaging 0.5-1.5 mm in size. Some are strained and broken slightly to moderately, and some finer grained aggregates may have been recrystallized from coarser grains. Some grains are altered slightly to disseminated flakes of muscovite and irregular patches of calcite. Others contain moderately abundant disseminated grains of epidote averaging 0.03-0.07 mm in size.

Biotite and epidote commonly occur together in ragged patches up to a few mm across. Biotite forms flakes averaging 0.2-0.7 mm in size. Pleochroism is from pale to medium brownish green. Epidote forms ragged patches ranging from extremely fine grained up to 0.5 mm in grain size.

K-feldspar forms anhedral grains up to 2 mm in size. Perthitic textures are common. Some grains contain irregular patches of calcite.

Quartz forms a few patches up to 0.7 mm in length of extremely fine grained aggregates.

Sphene forms ragged to subhedral grains up to 0.3 mm in length and patches up to 0.6 mm across. It commonly is intergrown with biotite and less commonly with epidote.

Amphibole forms a few ragged, prismatic grains up to 0.9 mm long. It is pleochroic from pale to light green. Many grains are rimmed partly by biotite and sphene.

Apatite forms subhedral prismatic grains averaging 0.07-0.15 mm long.

Ilmenite forms a few grains averaging 0.07 mm in size.

Chalcopyrite forms anhedral grains averaging 0.03-0.1 mm in size, mainly associated with epidote. Alteration is moderate along grain borders to bright red/brown hematite.

Pyrite forms a few equant grains averaging 0.03 mm in size.

Sample 52585 Trench 90-17 Slightly Deformed Granodiorite

The rock is a medium grained, granodiorite dominated by plagioclase with less quartz and K-feldspar, and much less epidote and biotite. Major accessory minerals are sphene and magnetite. It was sheared and recrystallized slightly; quartz was recrystallized most strongly, and sericite-rich seams were formed.

plagioclase	60-65%	sphene	0.5%
quartz	17-20	magnetite	0.2
K-feldspar	7- 8	apatite	minor
epidote	4- 5	pyrite	minor
biotite	4- 5		
sericite	1- 2		

Plagioclase forms anhedral grains averaging 0.5-1.5 mm in size. A few megacrysts are up to 2.5 mm across. Many larger grains are strained and warped slightly, and a few are warped moderately. Many contain abundant dusty hematite inclusions. Alteration generally is weak to disseminated flakes of sericite or patches of epidote. Thin rims on many grains against K-feldspar were recrystallized and are free of dusty inclusions.

Quartz forms anhedral grains averaging 0.5-1 mm in size in patches interstitial to plagioclase. Most are strained slightly to moderately, and some are recrystallized slightly to much finer subgrain aggregates with slightly disoriented extinction positions. Many quartz-rich patches were recrystallized to much finer grained aggregates in incipient shear zones. Locally, these recrystallized patches also contain moderately abundant very fine grained plagioclase. Associated with many of the shear zones are seams of sericite/muscovite.

K-feldspar forms a few megacrysts up to a few mm across. More commonly it forms anhedral, interstitial grains averaging 0.3-1 mm in size. A few grains are slightly perthitic.

Epidote and biotite generally occur together in irregular to elongate patches up to 1.5 mm in size. Epidote grains commonly are granular and average 0.05-0.15 mm in size. Epidote also forms a few discontinuous veinlets up to 0.05 mm wide.

Biotite forms ragged to subhedral flakes averaging 0.1-0.3 mm in size, mainly in clusters associated with minor to abundant epidote. A few flakes are from 0.5-1.2 mm long. Pleochroism is from pale to medium green or brownish green. In a few lenses up to 1.5 mm long and in a few patches associated with epidote, biotite was replaced completely by pseudomorphic chlorite and minor Ti-oxide.

Sericite is concentrated in wispy seams between plagioclase grains, and in a few larger seams associated with epidote. A few grains of muscovite up to 0.4 mm in size are present away from the seams.

Sphene forms subhedral to euhedral grains averaging 0.2-0.6 mm in length. One irregular elongate grain is 1 mm long. Mainly anhedral grains averaging 0.1-0.15 mm in size occur in patches of biotite-epidote.

Magnetite forms disseminated, subhedral to euhedral grains averaging 0.1-0.25 mm in size.

Apatite forms equant grains up to 0.17 mm in size mainly associated with biotite-epidote patches.

Pyrite forms anhedral grain up to 0.15 mm in size mainly associated with biotite-epidote patches. Pyrite is altered slightly to completely to hematite.

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Calcite forms irregular grains averaging 0.05-0.1 mm in size intergrown with patches of recrystallized quartz. It also forms a few grains up to 0.4 mm in size in discontinuous veinlets cutting plagioclase grains.

One megacryst of K-feldspar is cut by a gash vein up to 0.7 mm wide containing calcite grains up to 0.7 mm in size intergrown with less very fine grained quartz and moderately abundant flakes of chlorite up to 0.5 mm long. Chlorite is pleochroic from pale yellowish green to medium green.

Phenocrysts of plagioclase are set in a very fine to fine grained groundmass dominated by plagioclase, with much less hornblende, epidote and chlorite. Textures suggest that the rock was metamorphosed and recrystallized slightly.

phenocrysts		ilmenite	0.2%
plagioclase	12-15%	chalcopryrite	0.1
groundmass		magnetite	0.1
plagioclase		sphene	minor
a) altered	65-70	biotite	minor
b) interstitial, fresh	2- 3	apatite	minor
epidote	7- 8	muscovite	trace
hornblende	3- 4		
chlorite	3- 4		
pyrite	1		
calcite	0.2		

Plagioclase forms phenocrysts averaging 1-2.5 mm in size. They are altered slightly to muscovite flakes up to 0.2 mm in size and ragged patches of calcite averaging 0.05-0.15 mm in size.

In the groundmass, plagioclase forms anhedral grains averaging 0.2-0.7 mm in size. Alteration is slight to moderate to patches of extremely fine grained sericite. Many grains contain abundant dusty inclusions of hematite. Fresh (more sodic?) plagioclase forms interstitial grains averaging 0.1-0.2 mm in size.

Hornblende forms equant subhedral to ragged grains averaging 0.1-0.3 mm in size. pleochroism is from light to medium brownish green. Patches of epidote and chlorite may be secondary after hornblende.

Epidote forms irregular patches up to 1 mm in size of grains averaging 0.1-0.5 mm in size.

Chlorite forms patches of grains averaging 0.1-0.3 mm in grain size. Pleochroism is from pale to light green.

Calcite forms anhedral interstitial grains averaging 0.08-0.15 mm in size, commonly associated with chlorite or hornblende.

Pyrite forms disseminated, equant grains averaging 0.05-0.25 mm in size.

Ilmenite forms grains averaging 0.1-0.3 mm across; many contain tiny, parallel exsolution plates of hematite. Alteration is moderate to strong along grain borders to Ti-oxide/sphene. Sphene forms anhedral grains up to 0.3 mm across.

Magnetite forms a few anhedral, equant grains averaging 0.15-0.2 mm in size.

Biotite forms a few flakes up to 0.5 mm in length. Pleochroism is from light to medium/dark greenish brown.

Chalcopryrite forms disseminated patches averaging 0.02-0.15 mm across. In a few patches, grains are altered moderately on their margins to limonite.

Apatite forms equant grains averaging 0.05-0.15 mm in size, commonly associated with epidote-chlorite.

Muscovite forms equant flakes averaging 0.1 mm in size, commonly intergrown with epidote.

Plagioclase-rich Segregation and Epidote-rich Replacement Band

The rock contains bands of amphibolite dominated by hornblende and plagioclase and a large felsic-rich band, possibly formed by metamorphic segregation, dominated by plagioclase with much less hornblende, epidote, and chlorite. A replacement band in the felsic-rich layer is dominated by epidote. Accessory minerals include sphene, apatite, and pyrite.

amphibolite (15-17% of thin section; one main, one minor band)

hornblende	50-55%	chlorite	1- 2%
plagioclase	40-45	sphene	0.2

Hornblende forms equant to slightly elongate grains averaging 0.3-0.8 mm in size. Pleochroism is from light/medium brownish green to medium green.

Plagioclase forms equant, submosaic grains averaging 0.15-0.4 mm in size. Alteration is slight to extremely fine grained flakes of sericite and patches of epidote. A few more strongly altered patches up to 0.7 mm in size contain abundant epidote grains averaging 0.05-0.2 mm in size and extremely fine grained sericite flakes. Muscovite forms disseminated flakes averaging 0.1-0.4 mm in size, probably as a replacement of plagioclase.

Chlorite forms flakes averaging 0.07-0.15 mm in size, mainly bordering hornblende grains. Pleochroism is from pale to light green.

Sphene forms irregular, grains averaging 0.03-0.07 mm in size, and a few elongate grains up to 0.12 mm long. It commonly is associated with chlorite.

felsic layers (75-80% of thin section)

plagioclase	82-85%	pyrite	0.1%
hornblende	8-10	magnetite	minor
epidote	5- 7	muscovite	minor
chlorite	1- 2	chalcopyrite	trace
apatite	0.2	calcite	trace
sphene/Ti-oxide	0.2		

Plagioclase forms anhedral, slightly interlocking grains averaging 0.3-0.8 mm in size. Alteration is moderate to disseminated, very fine grained flakes of sericite and patches of epidote. Muscovite forms a few equant flakes up to 0.1 mm across; these probably are secondary after plagioclase.

Hornblende forms subhedral grains averaging 0.7-1 mm long. Some are pleochroic from light to medium brownish green. Some are replaced by pale green actinolite, and some are replaced by intimate intergrowths of actinolite and epidote.

Epidote forms a few patches up to 1 mm in size of very fine to fine grained aggregates.

Chlorite forms scattered patches of flakes up to 0.4 mm long, commonly associated with epidote patches. Pleochroism is from pale to light green.

Sphene/Ti-oxide forms anhedral grains averaging 0.03-0.05 mm in size, and a few up to 0.25 mm across. Ti-oxide forms aggregates in the core of the patch, which are intergrown with and surrounded by sphene.

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Apatite forms disseminated, equant to stubby prismatic grains averaging 0.07-0.15 mm in size.

Pyrite forms equant, anhedral to euhedral grains up to 0.4 mm across.

Magnetite forms a few subhedral, equant grains averaging 0.15-0.2 mm in size.

A patch of chalcopyrite 0.4 mm across surrounds a euhedral epidote grain. Smaller chalcopyrite patches average 0.02-0.05 mm in size.

Calcite forms anhedral, interstitial grains averaging 0.05 mm in size.

epidote-rich layer (5-7% of rock)

A band up to a few mm wide in the core of the felsic layer is dominated by interlocking intergrowths of epidote averaging 0.2-0.5 mm in size, with much less abundant interstitial plagioclase and amphibole. Bordering this zone is a zone up to a few mm wide which is gradational to the felsic layer, except that it much more abundant epidote than norma, and in part contains plagioclase aggregates averaging 0.5-0.8 mm in size, which contain only minor replacement patches of epidote and sericite. Cavities averaging 0.05-0.15 mm in size in the main epidote patch may be primary.

The rock is well foliated and dominated by plagioclase grains in a groundmass of muscovite. A few layers contain coarser grained detrital plagioclase. At one end, plagioclase is coarser grained. Minor minerals include apatite, pyrite, and Ti-oxide. Accessory minerals include zircon and scheelite.

plagioclase	
detrital grains	4- 5%
finer grains	50-55
coarse grained zone	7- 8
sericite	25-30
pyrite	3- 4
Ti-oxide	1- 2
apatite	1- 2
calcite	1
scheelite	trace
zircon	trace

Plagioclase forms relic phenocrysts averaging 0.2-0.5 mm in size. They are concentrated moderately to strongly in a few layers up to 1 mm wide. Most are altered slightly to sericite and dusty semiopaque. Some contain moderately abundant, ragged, interstitial patches of calcite. Elsewhere, plagioclase generally forms anhedral grains averaging 0.07-0.15 mm in size; these are fresh and lack dusty semiopaque inclusions. At one end, plagioclase was recrystallized to moderately interlocking aggregates of grains averaging 0.2-1 mm in size. Plagioclase in this zone contains minor to moderately abundant inclusions of muscovite.

Muscovite forms flakes averaging 0.05-0.1 mm in length. A few are from 0.2-0.7 mm long.

Calcite forms skeletal to equant patches up to 0.4 mm in size in much of the rock, and up to 0.8 mm in size in the coarser grained plagioclase zone.

Pyrite forms lenses up to a few mm long of anhedral to subhedral grains up to 0.5 mm in size, and disseminated, mainly anhedral grains averaging 0.05-0.2 mm in size. A very few larger grains contain an inclusion of chalcopyrite up to 0.05 mm long.

Apatite forms subhedral grains averaging 0.1-0.2 mm in size, with several up to 0.8 mm across.

Ti-oxide forms ragged patches up to 1 mm across and lenses parallel to foliation up to 1 mm long of cryptocrystalline aggregates, possibly after original sphene.

Scheelite forms a euhedral grain 0.5 mm across.

Zircon forms moderately abundant, equant euhedral grains averaging 0.05-0.08 mm across.