

APPENDIX A

CATALOG OF STUDIED ROCK SAMPLES

Study area	Location		Sample	Study					
				Lithology	Petrography	Geochemistry			
	E	N				Major oxides	Trace elements	LOI	REE
Mae Phrik	516181.7	1915922.3	BTK25/1-1	rhyodacite porphyry					
			BTK25/1-2	rhyodacite porphyry					
			BTK25/1-3	rhyolite porphyry					
	515879.4	1917823.9	BTK25/2-1	tuff					
			BTK25/2-2	tuff					
	514459	1919517.2	BTK25/4	tuff					
	515768.4	1913475.7	BTK25/5-1	tuff					
			BTK25/5-2	tuff					
	515526.4	1912620.5	BTK25/6-1	tuff					
			BTK25/6-2	tuff					
	516138.2	1912653.8	BTK25/7	rhyodacite					
	518005.1	1914791.8	BTK25/8-1	basalt					
			BTK25/8-2	granite					
			BTK25/8-3	basalt					
BTK25/8-4			granite						
Mae Salaem	5337740	19224717	MSL25/1-1	rhyolite porphyry					
			MSL25/1-2	tuff					
			MSL25/1-3	tuff					
			MSL25/1-4	tuff					
			MSL25/1-5	tuff					
	534772.2	1922655.2	MSL29/1-1	tuff					
			MSL29/1-2	tuff					
	534665.2	1922516.8	MSL29/2	tuff					
	534476.4	1922478.1	MSL29/3-1	tuff					
			MSL29/3-2	tuff					
	534233.4	1922451	MSL29/4-1	tuff					
			MSL29/4-2	tuff					
	533951.5	1922368.6	MSL29/5	tuff					
	533914.5	1922376.9	MSL29/6	tuff					

Study area	Location		Sample	Study					
				Lithology	Petrography	Geochemistry			
	E	N				Major oxides	Trace elements	LOI	REE
Pong Daeng	541459	1875199.3	PDNG30/1	tuff					
	538418.7	1887072	PDNG30/3	tuff					
	538438.4	1886969.4	PDNG30/4	basalt					
	538764	1886550	PDNG30/5	tuff					
	539172	1886453.3	PDNG30/6-1	tuff					
			PDNG30/6-2	tuff					
			PDNG30/6-3	tuff					
	539398.5	1886310.4	PDNG30/7-1	tuff					
			PDNG30/7-2	tuff					
	538408.4	1882659.4	PDNG30/8	tuff					
	537380	1882765	PDNG30/9-1	tuff					
			PDNG30/9-2	tuff					
			PDNG30/9-3	tuff					
			PDNG30/9-4	tuff					
	536396.3	1882960.1	PDNG30/10	tuff					
	535626.1	1882912	PDNG30/11	granodiorite					
	535359.9	1882984.1	PDNG30/12	granodiorite					
	534302.2	1883057.7	PDNG30/13-1	granodiorite					
			PDNG30/13-2	granodiorite					
	532915.5	1883774.7	PDNG30/14-1	granodiorite					
			PDNG30/14-2	granodiorite					
	533157.2	1883644.4	PDNG30/15	granodiorite					
	533475.3	1883482.8	PDNG30/16-1	granodiorite					
			PDNG30/16-2	granodiorite					
	533828.2	1883308.2	PDNG30/17-1	granodiorite					
			PDNG30/17-2	granodiorite					
	534217.9	1883109.5	PDNG30/18-1	granodiorite					
			PDNG30/18-2	granodiorite					

Study area	Location		Sample	Study						
				Lithology	Petrography	Geochemistry				
	E	N				Major oxides	Trace elements	LOI	REE	
Wang Luck	5399374	18978973	SK25/3-1	basaltic flow						
			SK25/3-2	basaltic flow						
			SK25/3-3	basaltic flow						
			SK25/3-4	tuff						
	5396631	19002325	SK25/6-1	tuff						
			SK25/6-2	tuff						
			SK25/6-3	tuff						
			SK25/6-4	tuff						
	5414615	19038223	SK25/7	tuff						
	544951.1	1888567.7	WL29/1-1	cumulus gabbro						
			WL29/1-2	cumulus gabbro						
			WL29/1-3	cumulus gabbro						
	544569.5	1888131.8	WL29/2-1	cumulus gabbro						
			WL29/2-2	gabbro						
	542939.1	1886575.6	WL29/3	gabbro						
	548533.1	1890162	WL29/6-1	tuff						
			WL29/6-2	tuff						
	551035.6	1892104.1	WL29/7-1	tuff						
			WL29/7-2	tuff						
WL29/7-3			tuff							
Wang Prachop	540725	1870637.2	WPC26/1	tuff						
	533213.1	1870316.8	WPC26/2-1	tuff						
			WPC26/2-2	tuff						
	531983	1870780.5	WPC26/3-1	rhyolite porphyry						
			WPC26/3-2	basalt flow						
	534746.1	1871927.2	WPC26/4	andesite porphyry						
	534742.7	1872480.1	WPC26/5-1	tuff						
			WPC26/5-2	tuff						
			WPC26/5-3	tuff						
			WPC26/5-4	tuff						
	534805.8	1872910.1	WPC26/6	basaltic tuff						
	534800.2	1873573.5	WPC26/7	andesite porphyry						
	534576.5	1875060.9	WPC26/8	tuff						
533804.4	1875647.3	WPC26/9-1	tuff							
		WPC26/9-2	tuff							
		WPC26/9-3	tuff							

Study area	Location		Sample	Study					
				Lithology	Petrography	Geochemistry			
	E	N				Major oxides	Trace elements	LOI	REE
Wang Prachop	534222.2	1875956.7	WPC26/10	andesite porphyry					
	534396.8	1876070.2	WPC26/11	andesite porphyry					
	534598.8	1876076.7	WPC26/12-1	andesite porphyry					
			WPC26/12-2	tuff					
	534683.8	1874852.6	WPC26/13	tuff					
	532732.8	1869531.1	WPC27/1	tuff					
	532962.9	1869503.8	WPC27/2	andesite					
	533142.6	1869515.6	WPC27/3-1	andesite					
			WPC27/3-2	basaltic tuff					
			WPC27/3-3	welded tuff-rhyolite					
			WPC27/3-4	welded tuff-rhyolite					
			WPC27/3-5	welded tuff-rhyolite					
			WPC27/3-6	welded tuff-rhyolite					
	532634.8	1869710.6	WPC27/4	welded tuff-rhyolite					
	532712.1	1869980.8	WPC27/6	tuff -basalt					
533133.1	1869977.2	WPC27/7-1	tuff-basalt						
		WPC27/7-2	tuff-basalt						
Wang Chao	523557.3	1858038	WCH26/2-1	rhyolite porphyry					
			WCH26/2-2	rhyolite porphyry					
	522885.9	1857829.1	WCH26/3-1	rhyolite porphyry					
			WCH26/3-2	rhyolite porphyry					
	522668.1	1857693.7	WCH26/4-1	rhyolite porphyry					
			WCH26/4-2	basalt					
			WCH26/4-3	gabbro					
			WCH26/4-4	gabbro					
	523553.5	1853142.5	WCH26/5-1	rhyolite porphyry					
			WCH26/5-2	tuff					
			WCH26/5-3	tuff					
			WCH26/5-4	tuff					
	523892.3	1852737.5	WCH26/6	tuff					
	523890.9	1851296.6	WCH27/1	tuff					
	523910.4	1851417.1	WCH27/2-2	basalt porphyry					
WCH27/2-3			basalt porphyry						

Study area	Location		Sample	Study					
				Lithology	Petrography	Geochemistry			
	E	N				Major oxides	Trace elements	LOI	REE
Wang Chao	524039.6	1851468.2	WCH27/3	tuff					
	524738	1850784.7	WCH27/4-1	tuff					
			WCH27/4-2	tuff					
			WCH27/4-3	tuff					
			WCH27/4-4	tuff					
	548365.2	1839774.3	WCH27/5-1	tuff					
			WCH27/5-2	basalt porphyry					
	531294.6	1843135.2	WCH28/1-1	basalt					
			WCH28/1-2	basalt flow					
			WCH28/1-3	basalt flow					
	530851.3	1836275.7	WCH28/4	basalt					
	529898.4	1843335	WCH28/8-1	basalt					
			WCH28/8-2	basalt					
			WCH28/8-3	tuff					

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APPENDIX B

PETROGRAPHY OF INDIVIDUAL STUDIED ROCK SAMPLES

Sample number BTK25/1-1

Rock name Rhyodacite

Lithology The brownish rock sample is a very fine-grain and shows a slightly porphyritic textures. It is a pinkish brown in color with a yellowish brown weathering surface. The phenocrysts are made up of quartz (colorless), feldspars (white), and opaque minerals (black), and are embedded in a very fine-grained groundmass.

Petrography

The rock sample shows a slightly porphyritic texture. The phenocrysts/microphenocrysts (10 modal %) are made up largely of quartz (6 modal %) and plagioclase (2 modal %), with small amounts of alkali feldspar (1 modal %) and opaque minerals (1 modal %). The groundmass phase is made up mainly of quartz-alkali feldspar devitrification with small amounts of quartz, alkali feldspar and chlorite.

Quartz phenocrysts/microphenocrysts are euhedral to subhedral (sizes up to 2 mm across). It commonly shows rounded edges and embayed outlines. Groundmass quartz is anhedral with sizes up to 0.1 mm across.

Plagioclase phenocryst/microphenocrysts are subhedral with sizes up to 1 mm across. These phenocrysts/microphenocrysts may have formed as a cluster of glomerocrysts. Plagioclase crystals show carlsbad twin and albite twin and is moderately replaced by sericite and clay minerals.

Alkali feldspar phenocrysts/microphenocrysts are subhedral to euhedral (sizes up to 1 mm across). They show simple twin and perthitic texture (sanidine type). Alkali feldspar in the groundmass phase is anhedral with sizes up to 0.1 mm across. Alkali feldspar is slightly replaced by clay minerals.

Opaque minerals phenocryst/microphenocrysts are subhedral with sizes up to 0.7 mm across. They are moderately altered to leucoxene. Groundmass opaque minerals are anhedral and fine-grain with sizes up to 0.2 mm across. Quartz-alkali feldspar intergrowth groundmass is devitrified from glass.

Chlorite patches are anhedral and fine-grain with sizes up to 0.1 mm across.

Sample number BTK25/1-2

Rock name Rhyodacite

Lithology The brownish rock sample is a very fine-grain and shows a slightly porphyritic textures. It is a pinkish brown in color with a yellowish brown weathering surface. The phenocrysts are made up of quartz (colorless), feldspars (white), and opaque minerals (black), and are embedded in a very fine-grained groundmass.

Petrography

The rock sample shows a slightly porphyritic texture. The phenocrysts/microphenocrysts (10 modal %) are made up largely of quartz (4.5 modal %) and plagioclase (4 modal %), with small amounts of alkali feldspar (1 modal %) and opaque minerals (0.5 modal %). The groundmass phase is made up mainly of quartz-alkali feldspar devitrification, with small amounts of quartz, alkali feldspar, opaque minerals and muscovite.

Quartz phenocrysts/microphenocrysts are euhedral to subhedral (sizes up to 1.75 mm across). It commonly shows rounded edges and embayed outlines. Groundmass quartz is anhedral with sizes up to 0.1 mm across.

Plagioclase phenocryst/microphenocrysts are subhedral with sizes up to 1.25 mm across. These phenocrysts/microphenocrysts may have formed as a cluster of glomerocrysts. Plagioclase crystals show carlsbad twin and albite twin and is moderately replaced by sericite and clay minerals.

Alkali feldspar phenocrysts/microphenocrysts are subhedral to euhedral (sizes up to 1.25 mm across). They show simple twin and perthitic texture (sanidine type). Alkali feldspar in the groundmass phase is anhedral with sizes up to 0.1 mm across. Alkali feldspar is highly replaced by clay minerals.

Opaque minerals phenocryst/microphenocrysts are subhedral with sizes up to 0.5 mm across. They are moderately altered to leucoxene. Groundmass opaque minerals are anhedral and fine-grain with sizes up to 0.2 mm across. Quartz-alkali feldspar intergrowth groundmass is devitrified from glass.

Muscovite in the groundmass phase is anhedral and fine-grain with sizes up to 0.1 mm across.

Sample number BTK25/7

Rock name Rhyodacite

Lithology The brownish gray rock sample is a very fine-grain and shows a slightly porphyritic textures. It is a pinkish brown in color with a yellowish brown weathering surface. The phenocrysts are made up of quartz (colorless), feldspars (white), and opaque minerals (black), and are embedded in a very fine-grained groundmass. This sample is made up mostly of alkali feldspar.

Petrography

The rock sample shows a slightly porphyritic texture. The phenocrysts/microphenocrysts are made up largely of plagioclase with small amount of quartz and alkali feldspar. The groundmass phase is made up mainly of quartz-alkali feldspar devitrification with small amounts of quartz, alkali feldspar, chlorite, and opaque minerals.

Plagioclase phenocryst/microphenocrysts are subhedral with sizes up to 1 mm across. These phenocrysts/microphenocrysts may have formed as a cluster of glomerocrysts. Plagioclase crystals show carlsbad twin and albite twin and is moderately replaced by sericite and clay minerals.

Quartz phenocrysts/microphenocrysts are euhedral to subhedral (sizes up to 0.75 mm across). It commonly shows rounded edges and embayed outlines. Groundmass quartz is anhedral with sizes up to 0.1 mm across.

Alkali feldspar phenocrysts/microphenocrysts are subhedral to euhedral (sizes up to 0.75 mm across). They show simple twin and perthitic texture (sanidine type). Alkali feldspar in the groundmass phase is anhedral with sizes up to 0.1 mm across. Alkali feldspar is slightly replaced by clay minerals. Quartz-alkali feldspar intergrowth groundmass is devitrified from glass. Chlorite patches are anhedral and fine-grain with sizes up to 0.2 mm across. Opaque minerals in the groundmass phase are anhedral and fine-grain with sizes up to 0.2 mm across.

Sample number BTK25/8-1

Rock name Basalt

Lithology The rock sample has a dark green color and its surface is cover by dark yellowish brown materials. It has a very fine-grained texture.

Petrography

The rock sample shows a slightly porphyritic texture. The phenocrysts/microphenocrysts (10 modal %) are made up largely of plagioclase (7 modal %) with small amount of unidentified mafic mineral (3 modal %). The groundmass phase is made up mainly of plagioclase, with small amounts of unidentified mafic minerals, and opaque minerals. Plagioclase and clinopyroxene in the groundmass phase are ophitic/subohitic intergrowth.

Plagioclase phenocryst/microphenocrysts are subhedral with sizes up to 1 mm across. Their crystals show polysynthetic twin and are broken. Groundmass plagioclase is anhedral with sizes up to 0.1 mm across. Plagioclase is slightly replaced by sericite and clay minerals. Plagioclase crystals are broken and fold by deformation.

Unidentified mafic minerals phenocrysts/microphenocrysts are subhedral to euhedral (sizes up to 0.5 mm across). Groundmass unidentified mafic minerals are anhedral with sizes up to 0.1 mm across. Unidentified mafic minerals are completely replaced by serpentine/chlorite. Opaque minerals in the groundmass phase are anhedral and fine-grain with sizes up to 0.1 mm across.

Sample number BTK25/8-3

Rock name Basalt

Lithology The rock sample has a dark green color and its surface is cover by dark yellowish brown materials. It has a very fine-grained texture.

Petrography

The rock sample shows a slightly porphyritic texture. The phenocrysts/microphenocrysts (6 modal %) are made up largely of unidentified mafic minerals (4.5 modal %) with small amount of plagioclase (1.5 modal %). The groundmass phase is made up mainly of plagioclase, with small amounts of unidentified mafic minerals, and opaque minerals. Plagioclase and clinopyroxene in the groundmass phase are ophitic/subohitic intergrowth.

Unidentified mafic minerals phenocrysts/microphenocrysts are subhedral to euhedral (sizes up to 0.5 mm across). Groundmass unidentified mafic minerals are anhedral with sizes up to 0.1 mm across. Unidentified mafic minerals are completely replaced by serpentine/chlorite.

Plagioclase phenocryst/microphenocrysts are subhedral with sizes up to 1 mm across. Their crystals show polysynthetic twin and are broken. Groundmass plagioclase is anhedral with sizes up to 0.1 mm across. Plagioclase is slightly replaced by sericite and clay minerals. Opaque minerals in the groundmass phase are anhedral and fine-grain with sizes up to 0.1 mm across.

Sample number MSL25-1-1

Rock name Rhyolite

Lithology The rock sample has a very fine-grained and shows a slightly porphyritic texture. It is pale pink to reddish in color with a yellowish brown weathering on their surfaces. The phenocrysts are made up of quartz (colorless), feldspars (white), and opaque minerals (black), which are embedded in a very fine-grained groundmass.

Petrography

The rock sample shows a slightly porphyritic texture. The phenocrysts/microphenocrysts (6 modal %) are made up largely of quartz (2 modal %) and plagioclase (3.5 modal %) with small amount of alkali feldspar (0.5 modal %). The groundmass phase is made up mainly of quartz-alkali feldspar (granophyric and spherulitic) intergrowth with small amounts of quartz, alkali feldspar, muscovite, and opaque minerals.

Quartz phenocrysts/microphenocrysts are euhedral to subhedral (sizes up to 0.75 mm across). They commonly show rounded edges and embayed outlines. Groundmass quartz is anhedral with sizes up to 0.1 mm across.

Plagioclase phenocryst/microphenocrysts are subhedral with sizes up to 1.5 mm across. Their crystals show carlsbad twin and albite twin and is slightly to moderately replaced by sericite and clay minerals.

Alkali feldspar phenocrysts/microphenocrysts are subhedral to euhedral (sizes up to 1 mm across). They show simple twin and perthitic texture (sanidine type). Alkali feldspar in the groundmass phase is anhedral with sizes up to 0.1 mm across. Alkali feldspar is slightly replaced by clay minerals.

Quartz-alkali feldspar intergrowth groundmass is composed of microgranophyric intergrowth and spherulite (sizes up to 1.5 mm across). Granophyric intergrowth is made up of radial quartz embedded in alkali feldspar. Spherulite is radial aggregate of quartz and feldspar. Muscovite in the groundmass phase is anhedral and fine-grain with sizes up to 0.2 mm across. Opaque minerals in the groundmass phase are anhedral and fine-grain with sizes up to 0.2 mm across.

Sample number PDNG30/4

Rock name Basalt porphyry

Lithology The rock sample has a dark green color and its surface is cover by dark yellowish brown materials. It has very fine-grained texture.

Petrography

The rock sample shows a porphyritic texture. The phenocrysts/microphenocrysts (21.5 modal %) are made up of plagioclase (17 modal %) with small amount of unidentified mafic minerals (4.5 modal %). The groundmass phase is made up mainly of plagioclase, with small amounts of unidentified mafic minerals, and opaque minerals.

Felted plagioclase grains have two grain sizes, plagioclase phenocryst/microphenocrysts are subhedral with sizes up to 1.2 mm across. Their crystals show carlsbad twin. Groundmass plagioclase is

anhedral with sizes up to 0.1 mm across. Plagioclase is slightly replaced by sericite and clay minerals. Plagioclase crystals are broken and fold by deformation.

Unidentified mafic minerals phenocrysts/microphenocrysts are subhedral to euhedral (sizes up to 1.5 mm across). Groundmass unidentified mafic minerals are anhedral with sizes up to 0.1 mm across. Unidentified mafic minerals are completely replaced by chlorite and epidote. Opaque minerals in the groundmass phase are anhedral and fine-grain with sizes up to 0.1 mm across.

Sample number WL29/1-1

Rock name Cumulus Gabbro

Lithology The rock sample has a greenish gray in color and is fine-grained (grain size average less than 0.1 mm across). Tarnished surface is pale-moderate yellowish brown. It is made up of dark and white minerals.

Petrography

The rock sample is equigranular (grain size in the range of 0.2 - 1 mm across) and show cumulus texture. The cumulus crystals are made up mainly of plagioclase (56 modal %), with subordinate clinopyroxene (35 modal %) and unidentified mafic mineral (5 modal %). The intercumulus crystals comprise hornblende (1.5 modal %) and opaque mineral (magnetite?) (2.5 modal %) with small amount of apatite.

Plagioclase is euhedral to subhedral, long prismatic (sizes up to 0.8 mm across) and completely replaced by epidotes, sericite, and clay minerals. Plagioclase crystals line parallel along long axis.

Clinopyroxene is subhedral (sizes up to 1.5 mm across) and colorless. It is moderately to highly replace by epidote and serpentine/chlorite. Plagioclase inclusion has been observed in clinopyroxene crystals.

Unidentified mafic mineral is euhedral and has short-prismatic/prismatic shapes (sizes up to 0.5 mm across). It is completely replaced by serpentine/chlorite and small amounts pale brown amphibole and opaque minerals.

Hornblende is anhedral (sizes up to 0.5 mm across) and shows an intercumulus crystalization. It has a pleochroic formula as X = pale yellow, Y = yellowish brown and Z = greenish brow. Inclusions of unidentified mafic mineral, clinopyroxene and plagioclase are commonly present in this amphibole crystal.

Opaque mineral (magnetite?) is subhedral - equant (sizes up to 0.2 mm across) and intergranular with plagioclase laths. Apatite is euhedral and has a short-prismatic/prismatic shape (sizes up to 0.15 mm across). Apatite inclusion has been observed in plagioclase and clinopyroxene crystals.

Sample number WL29/1-2

Rock name Cumulus Gabbro

Lithology The rock sample has a greenish gray in color and is fine-grained (grain size average less than 0.1 mm across). Tarnished surface is pale-moderate yellowish brown. It is made up of dark and white minerals.

Petrography

The rock sample is equigranular (grain size in the range of 0.2 - 1 mm across) and show cumulus texture. The cumulus crystals are made up mainly of plagioclase (52.5 modal %), with subordinate clinopyroxene (40 modal %) and unidentified mafic mineral (4 modal %). The intercumulus crystals comprise hornblende (1.5 modal %) and opaque mineral (magnetite?) (2 modal %) with small amount of apatite.

Plagioclase is euhedral to subhedral, long prismatic (sizes up to 0.8 mm across) and completely replaced by epidotes, sericite, and clay minerals. Plagioclase crystals line parallel along long axis.

Clinopyroxene is subhedral (sizes up to 1.5 mm across) and colorless. It is moderately to highly replace by epidote and serpentine/chlorite. Plagioclase inclusion has been observed in clinopyroxene crystals.

Unidentified mafic mineral is euhedral and has short-prismatic/prismatic shapes (sizes up to 0.5 mm across). It is completely replaced by serpentine/chlorite and small amounts pale brown amphibole and opaque minerals.

Hornblende is anhedral (sizes up to 0.5 mm across) and shows an intercumulus crystalization. It has a pleochroic formula as X = pale yellow, Y = yellowish brown and Z = greenish brow. Inclusions of unidentified mafic mineral, clinopyroxene and plagioclase are commonly present in this amphibole crystal.

Opaque mineral (magnetite?) is subhedral - equant (sizes up to 0.2 mm across) and intergranular with plagioclase laths. Apatite is euhedral and has a short-prismatic/prismatic shape (sizes up to 0.15 mm across). Apatite inclusion has been observed in plagioclase and clinopyroxene crystals.

Sample number WL29/1-3

Rock name Cumulus Gabbro

Lithology The rock sample has a greenish gray in color and is fine-grained (grain size average less than 0.1 mm across). Tarnished surface is pale-moderate yellowish brown. It is made up of dark and white minerals.

Petrography

The rock sample is equigranular (grain size in the range of 0.2 - 1 mm across) and show cumulus texture. The cumulus crystals are made up mainly of plagioclase (46 modal %), with subordinate clinopyroxene (37 modal %) and unidentified mafic mineral (7.5 modal %). The intercumulus crystals comprise hornblende (3 modal %) and opaque mineral (magnetite?) (6.5 modal %).

Plagioclase is euhedral to subhedral, long prismatic (sizes up to 0.8 mm across) and completely replaced by epidotes, sericite, and clay minerals. Plagioclase crystals line parallel along long axis.

Clinopyroxene is subhedral (sizes up to 1 mm across) and colorless. It is slightly replaced by epidote and serpentine/chlorite. Plagioclase inclusion has been observed in clinopyroxene crystals.

Unidentified mafic mineral is euhedral and has short-prismatic/prismatic shapes (sizes up to 1 mm across). It is completely replaced by serpentine/chlorite and small amounts pale brown amphibole and opaque minerals.

Hornblende is anhedral (sizes up to 1 mm across) and shows an intercumulus crystallization. It has a pleochroic formula as X = pale yellow, Y = yellowish brown and Z = greenish brown. Inclusions of unidentified mafic mineral, clinopyroxene and plagioclase are commonly present in this amphibole crystal.

Opaque mineral (magnetite?) is anhedral with sizes up to 0.5 mm across and slightly replaced by titanite/leucosene. It formed as intercumulus crystallization. Plagioclase inclusion can be observed in the opaque mineral.

Sample number WL29//2-1

Rock name Cumulus Gabbro

Lithology The rock sample has a greenish gray in color and is fine-grained (grain size average less than 0.1 mm across). Tarnished surface is pale-moderate yellowish brown. It is made up of dark and white minerals.

Petrography

The rock sample is equigranular (grain size in the range of 0.2 - 1 mm across) and show cumulus texture. The cumulus crystals are made up mainly of plagioclase (57 modal %), with subordinate clinopyroxene (32.5 modal %) and unidentified mafic mineral (8 modal %). The intercumulus crystals comprise hornblende (1.5 modal %) and opaque mineral (magnetite?) (1 modal %).

Plagioclase is euhedral to subhedral, long prismatic (sizes up to 0.8 mm across) and completely replaced by epidotes, sericite, and clay minerals. Plagioclase crystals line parallel along long axis.

Clinopyroxene is subhedral (sizes up to 1 mm across) and colorless. It is slightly replaced by epidote and serpentine/chlorite. Plagioclase inclusion has been observed in clinopyroxene crystals.

Unidentified mafic mineral is euhedral and has short-prismatic/prismatic shapes (sizes up to 0.75 mm across). It is completely replaced by serpentine/chlorite and small amounts pale brown amphibole and opaque minerals.

Hornblende is anhedral (sizes up to 0.5 mm across) and shows an intercumulus crystallization. It has a pleochroic formula as X = pale yellow, Y = yellowish brown and Z = greenish brown. Inclusions of unidentified mafic mineral, clinopyroxene and plagioclase are commonly present in this amphibole crystal.

Opaque mineral (magnetite?) is anhedral with sizes up to 0.2 mm across and slightly replaced by titanite/leucoxene. It formed as intercumulus crystallization. Plagioclase inclusion can be observed in the opaque mineral.

Sample number WL29/2-2

Rock name Gabbro

Lithology The rock sample has a greenish gray color and surface is cover by dark yellowish brown materials. It is equigranular and fine-grained (grain sizes less than 1 mm across). The sample contains a white lath shape crystals (plagioclase) and a green crystals (pyroxene).

Petrography

The rock sample is slightly porphyritic with clinopyroxene (4 modal %), plagioclase (3 modal %), and unidentified minerals (1.5 modal %) phenocrysts/microphenocrysts. The groundmass phase is made up largely of plagioclase (56.5 modal %) and clinopyroxene (35 modal %), with small amount of opaque mineral (magnetite ?) (10 modal %). Plagioclase and clinopyroxene in the groundmass phase are ophitic/subohitic intergrowth.

Clinopyroxene phenocrysts/microphenocrysts are subhedral (sizes up to 1.2 mm across), whereas groundmass plagioclase is subhedral and long prismatic (grain sizes average in the range of 0.05 - 0.15 mm across). They are slightly replaced by epidote and serpentine/chlorite. Plagioclase inclusion has been observed in clinopyroxene crystals.

Plagioclase phenocrysts/microphenocrysts are euhedral and short prismatic (sizes up to 0.75 mm across), whereas groundmass plagioclase is subhedral and long prismatic (grain sizes average in the range of 0.05 - 0.15 mm across). Plagioclase is moderately replaced by epidotes, clay minerals, and sericite.

Unidentified mafic mineral phenocrysts/microphenocrysts are subhedral and has short-primaic/prismatic shapes (sizes up to 0.75 mm across), whereas groundmass plagioclase is subhedral and long prismatic (grain sizes average in the range of 0.05 - 0.15 mm across). It is completely replaced by serpentine/chlorite. Opaque mineral (magnetite ?) is subhedral - equant (sizes up to 0.2 mm across) and intergranular with plagioclase laths.

Sample number WL29/3

Rock name Gabbro

Lithology The rock sample has a dark green color and surface is covered by dark yellowish brown materials. It is equigranular and fine-grained (grain sizes less than 1 mm across). The sample contains a white lath shape crystals (plagioclase) and a green crystals (pyroxene).

Petrography

The rock sample is made up largely of plagioclase (54 modal %) and clinopyroxene (28.5 modal %), with subordinate unidentified mafic minerals (13 modal %), with small amount of apatite opaque mineral (magnetite ?) (4.5 modal %). Plagioclase and clinopyroxene in the groundmass phase are ophitic/subhedral intergrowth.

Plagioclase is euhedral and short prismatic (sizes up to 0.75 mm across). Plagioclase is moderately replaced by epidotes, clay minerals, and sericite.

Clinopyroxene is subhedral (sizes up to 1.5 mm across) and colorless. It is slightly replaced by epidote and serpentine/chlorite. Plagioclase inclusion has been observed in clinopyroxene crystals.

Unidentified mafic mineral is euhedral and has short-primaic/prismatic shapes (sizes up to 0.5 mm across). It is completely replaced by serpentine/chlorite and small amounts pale brown amphibole and opaque minerals. Opaque mineral (magnetite ?) is subhedral - equant (sizes up to 0.2 mm across) and intergranular with plagioclase laths.

Sample number WPC26/3-1

Rock name Rhyolite

Lithology The rock sample is a very fine-grain and shows a slightly porphyritic texture. It has a grayish color and a brownish weathering surface. The phenocrysts are made up of quartz (colorless) and feldspars (white), which is embedded in the very fine-grained groundmass.

Petrography

The rock sample shows slightly porphyritic texture. The phenocrysts/microphenocrysts (5 modal %) are made up largely of quartz (3.5 modal %) and plagioclase (1 modal %) with small amount of alkali feldspar (0.5 modal %). The groundmass phase is made up mainly of quartz-alkali feldspar granophyric intergrowth, with small amounts of quartz, alkali feldspar, and opaque minerals.

Quartz phenocrysts/microphenocrysts are euhedral to subhedral (sizes up to 1 mm across). They commonly show rounded edges and embayed outlines. Groundmass quartz is anhedral with sizes up to 0.1 mm across.

Plagioclase phenocryst/microphenocrysts are subhedral with sizes up to 0.75 mm across. Their crystals show carlsbad twin and albite twin and is slightly replaced by sericite and clay minerals.

Alkali feldspar phenocrysts/microphenocrysts are subhedral to euhedral (sizes up to 0.75 mm across). They show simple twin and perthitic texture (sanidine type). Alkali feldspar in the groundmass phase is anhedral with sizes up to 0.1 mm across. Alkali feldspar is slightly replaced by clay minerals.

Quartz-alkali feldspar intergrowth groundmass is composed of microgranophyric intergrowth (sizes up to 1.5 mm across). Granophyric intergrowth is made up of radial quartz embedded in alkali feldspar. Opaque minerals in the groundmass phase are anhedral and fine-grain with sizes up to 0.1 mm across.

Sample number WPC26/4

Rock name Andesite porphyry

Lithology The rock sample has a dark green color and its surface is cover by dark yellowish brown materials. It has very fine-grained texture.

Petrography

The rock sample shows a highly porphyritic texture. The phenocrysts/microphenocrysts (29.5 modal %) are made up of plagioclase (15 modal %) with small amount of opaque minerals (6.5 modal %), unidentified mafic minerals (5 modal %) and clinopyroxene (3 modal %). The

phenocrysts/microphenocrysts may form as glomerocrysts and cumulo-crysts. The groundmass phase is made up mainly of plagioclase, with small amounts of unidentified mafic minerals, and opaque minerals.

Felted plagioclase grains have two grain sizes, plagioclase phenocryst/microphenocrysts are subhedral with sizes up to 1.5 mm across. Their crystals show carlsbad twin. Groundmass plagioclase is anhedral with sizes up to 0.1 mm across. Plagioclase is moderately replaced by sericite and clay minerals. Inclusion of apatite is present some grains.

Opaque minerals phenocrysts/microphenocrysts are subhedral to anhedral (sizes up to 0.5 mm across). Groundmass opaque minerals are anhedral with sizes up to 0.1 mm across.

Unidentified mafic minerals phenocrysts/microphenocrysts are subhedral to euhedral (sizes up to 1 mm across). Groundmass unidentified mafic minerals are anhedral with sizes up to 0.1 mm across. Unidentified mafic minerals are completely replaced by serpentine/chlorite and epidote.

Clinopyroxene is colorless and anhedral (averaged size 1 mm across). It is slightly altered to brown amphibole, chlorite. Fractures are commonly present in the crystals including serpentine/chlorite.

Sample number WPC26/7

Rock name Andesite porphyry

Lithology The rock sample has a dark green color and its surface is cover by dark yellowish brown materials. It has very fine-grained texture.

Petrography

The rock sample shows a highly porphyritic texture. The phenocrysts/microphenocrysts (50 modal %) are made up of plagioclase (24 modal %) with small amount of unidentified mafic minerals (16.75 modal %), clinopyroxene (7 modal %), and opaque minerals (2.25 modal %). The groundmass phase is made up mainly of plagioclase, with small amounts of unidentified mafic minerals, opaque minerals, and apatite.

Felted plagioclase grains have two grain sizes, plagioclase phenocryst/microphenocrysts are subhedral with sizes up to 2.1 mm across. Its crystals show carlsbad twin. Groundmass plagioclase is anhedral with sizes up to 0.1 mm across. Plagioclase is highly replaced by sericite and clay minerals. Inclusion of apatite is present some grains.

Unidentified mafic minerals phenocrysts/microphenocrysts are subhedral to euhedral (sizes up to 1.5 mm across). Groundmass unidentified mafic minerals are anhedral with sizes up to 0.1 mm across. Unidentified mafic minerals are completely replaced by serpentine/chlorite.

Clinopyroxene is colorless and anhedral (averaged size 1.7 mm across). It is moderately altered to brown amphibole, chlorite. Fractures are commonly present in the crystals including serpentine/chlorite. Inclusion of apatite and opaque minerals are present some grains.

Opaque minerals phenocrysts/microphenocrysts are subhedral to anhedral (sizes up to 0.7 mm across). Groundmass opaque minerals are anhedral with sizes up to 0.1 mm across. Apatite is euhedral and has a short-prismatic/prismatic shape (sizes up to 0.15 mm across). Apatite inclusion has been observed in plagioclase and clinopyroxene crystals.

Sample number WPC26/10

Rock name Andesite porphyry

Lithology The rock sample has a dark green color and its surface is covered by dark yellowish brown materials. It has very fine-grained texture.

Petrography

The rock sample shows a highly porphyritic texture. The phenocrysts/microphenocrysts (42.5 modal %) are made up of plagioclase (23 modal %) with small amount of unidentified mafic minerals (9 modal %), clinopyroxene (8.5 modal %), and opaque minerals (2 modal %). The groundmass phase is made up mainly of plagioclase, with small amounts of unidentified mafic minerals, opaque minerals, and apatite.

Felted plagioclase grains have two grain sizes, plagioclase phenocryst/microphenocrysts are subhedral with sizes up to 2 mm across. Their crystals show carlsbad twin. Groundmass plagioclase is anhedral with sizes up to 0.1 mm across. Plagioclase is completely replaced by sericite and clay minerals. Inclusion of clinopyroxene and apatite are present some grains.

Unidentified mafic minerals phenocrysts/microphenocrysts are subhedral to euhedral (sizes up to 1 mm across). Groundmass unidentified mafic minerals are anhedral with sizes up to 0.1 mm across. Unidentified mafic minerals are completely replaced by serpentine/chlorite.

Clinopyroxene is colorless and anhedral (averaged size 1.2 mm across). It is slightly altered to brown amphibole and serpentine/chlorite. Fractures are commonly present in the crystals including serpentine/chlorite. Inclusion of apatite is present some grains.

Opaque minerals phenocrysts/microphenocrysts are subhedral to anhedral (sizes up to 0.7 mm across). Groundmass opaque minerals are anhedral with sizes up to 0.1 mm across. Apatite is euhedral and has a short-prismatic/prismatic shape (sizes up to 0.15 mm across). Apatite inclusion has been observed in plagioclase and clinopyroxene crystals.

Sample number WPC26/11

Rock name Andesite porphyry

Lithology The rock sample has a dark green color and its surface is cover by dark yellowish brown materials. It has very fine-grained texture.

Petrography

The rock sample shows a highly porphyritic texture. The phenocrysts/microphenocrysts (41.75 modal %) are made up of plagioclase (28 modal %) with small amount of clinopyroxene (6 modal %), unidentified mafic minerals (5.75 modal %), and opaque minerals (2 modal %). The groundmass phase is made up mainly of plagioclase, with small amounts of unidentified mafic minerals, opaque minerals, and apatite.

Felted plagioclase grains have two grain sizes, plagioclase phenocryst/microphenocrysts are subhedral with sizes up to 1.5 mm across. Their crystals show carlsbad twin. Groundmass plagioclase is anhedral with sizes up to 0.1 mm across. Plagioclase is highly replaced by sericite and clay minerals. Inclusion of apatite is present some grains.

Clinopyroxene is colorless and anhedral (averaged size 1.5 mm across). It is slightly altered to serpentine/chlorite. Fractures are commonly present in the crystals including serpentine/chlorite. Inclusion of apatite and opaque minerals is present some grains.

Unidentified mafic minerals phenocrysts/microphenocrysts are subhedral to euhedral (sizes up to 0.8 mm across). Groundmass unidentified mafic minerals are anhedral with sizes up to 0.1 mm across. Unidentified mafic minerals are completely replaced by serpentine/chlorite.

Opaque minerals phenocrysts/microphenocrysts are subhedral to anhedral (sizes up to 0.7 mm across). Groundmass opaque minerals are anhedral with sizes up to 0.1 mm across. Apatite is euhedral and has a short-prismatic/prismatic shape (sizes up to 0.15 mm across). Apatite inclusion has been observed in plagioclase and clinopyroxene crystals.

Sample number WPC26/12

Rock name Andesite porphyry

Lithology The rock sample has a dark green color and its surface is cover by dark yellowish brown materials. It has very fine-grained texture.

Petrography

The rock sample shows a highly porphyritic texture. The phenocrysts/microphenocrysts (43.25 modal %) are made up of plagioclase (25.5 modal %) with small amount of unidentified mafic minerals (9 modal %), clinopyroxene (6 modal %), and opaque minerals (2.75 modal %). The groundmass phase is made up mainly of plagioclase, with small amounts of unidentified mafic minerals, opaque minerals, and apatite.

Felted plagioclase grains have two grain sizes, plagioclase phenocryst/microphenocrysts are subhedral with sizes up to 2 mm across. Their crystals show carlsbad twin. Groundmass plagioclase is anhedral with sizes up to 0.1 mm across. Plagioclase is highly replaced by sericite and clay minerals. Inclusion of apatite is present some grains.

Unidentified mafic minerals phenocrysts/microphenocrysts are subhedral to euhedral (sizes up to 1 mm across). Groundmass unidentified mafic minerals are anhedral with sizes up to 0.1 mm across. Unidentified mafic minerals are completely replaced by serpentine/chlorite.

Clinopyroxene is colorless and anhedral (averaged size 1 mm across). Some crystals show character of exsolution structure that is made up of lamellae clinopyroxene in orthopyroxene host. It is slightly altered to serpentine/chlorite. Fractures are commonly present in the crystals including serpentine/chlorite. Inclusion of apatite and opaque minerals is present some grains.

Opaque minerals phenocrysts/microphenocrysts are subhedral to anhedral (sizes up to 0.5 mm across). Groundmass opaque minerals are anhedral with sizes up to 0.1 mm across. Apatite is euhedral and has a short-prismatic/prismatic shape (sizes up to 0.15 mm across). Apatite inclusion has been observed in plagioclase and clinopyroxene crystals.

Sample number WPC27/2

Rock name Andesite porphyry

Lithology The rock sample has a dark green color and its surface is cover by dark yellowish brown materials. It has very fine-grained texture.

Petrography

The rock sample shows a highly porphyritic texture. The phenocrysts/microphenocrysts (43.75 modal %) are made up of plagioclase (22 modal %) with small amount of unidentified mafic minerals (12.75 modal %), clinopyroxene (5.5 modal %), and opaque minerals (3.5 modal %). The phenocrysts/microphenocrysts may form as glomerocrysts and cumuloocrysts. The groundmass phase is made up mainly of plagioclase, with small amounts of unidentified mafic minerals, opaque minerals, and apatite.

Felted plagioclase grains have two grain sizes, plagioclase phenocryst/microphenocrysts are subhedral with sizes up to 2 mm across. Their crystals show carlsbad twin. Groundmass plagioclase is anhedral with sizes up to 0.1 mm across. Plagioclase is highly replaced by sericite and clay minerals. Inclusion of apatite is present some grains.

Unidentified mafic minerals phenocrysts/microphenocrysts are subhedral to euhedral (sizes up to 1 mm across). Groundmass unidentified mafic minerals are anhedral with sizes up to 0.1 mm across. Unidentified mafic minerals are completely replaced by serpentine/chlorite. Inclusion of apatite is present some grains.

Clinopyroxene is colorless and anhedral (averaged size 1 mm across). Some crystals show character of exsolution structure that is made up of lamellae clinopyroxene in orthopyroxene host. It is moderately altered to serpentine/chlorite. Fractures are commonly present in the crystals including serpentine/chlorite. Inclusion of apatite and opaque minerals is present some grains.

Opaque minerals phenocrysts/microphenocrysts are subhedral to anhedral (sizes up to 0.5 mm across). Groundmass opaque minerals are anhedral with sizes up to 0.1 mm across. Apatite is euhedral and has a short-prismatic/prismatic shape (sizes up to 0.15 mm across). Apatite inclusion has been observed in plagioclase, unidentified mafic minerals, and clinopyroxene crystals.

Sample number WPC27/3

Rock name Andesite porphyry

Lithology The rock sample has a dark green color and its surface is covered by dark yellowish brown materials. It has highly porphyritic and very fine-grained textures.

Petrography

The rock sample shows a highly porphyritic texture. The phenocrysts/microphenocrysts (44 modal %) are made up of plagioclase (28 modal %) with small amount of unidentified mafic minerals (7 modal %), clinopyroxene (7 modal %), and opaque minerals (2 modal %). The phenocrysts/microphenocrysts may form as glomerocrysts and cumulo-crysts. The groundmass phase is made up mainly of plagioclase, with small amounts of unidentified mafic minerals, opaque minerals, and apatite.

Felted plagioclase grains have two grain sizes, plagioclase phenocryst/microphenocrysts are subhedral with sizes up to 1.5 mm across. Their crystals show carlsbad twin. Groundmass plagioclase is anhedral with sizes up to 0.1 mm across. Plagioclase is highly replaced by sericite and clay minerals. Inclusion of apatite is present some grains.

Unidentified mafic minerals phenocrysts/microphenocrysts are subhedral to euhedral (sizes up to 1.2 mm across). Groundmass unidentified mafic minerals are anhedral with sizes up to 0.1 mm across. Unidentified mafic minerals are completely replaced by serpentine/chlorite. Inclusion of apatite is present some grains.

Clinopyroxene is colorless and anhedral (averaged size 1 mm across). Some crystals show character of exsolution structure that is made up of lamellae clinopyroxene in orthopyroxene host. It is moderately altered to serpentine/chlorite. Fractures are commonly present in the crystals including serpentine/chlorite. Inclusion of apatite and opaque minerals is present some grains.

Opaque minerals phenocrysts/microphenocrysts are subhedral to anhedral (sizes up to 0.5 mm across). Groundmass opaque minerals are anhedral with sizes up to 0.1 mm across. Apatite is euhedral and has a short-prismatic/prismatic shape (sizes up to 0.1 mm across). Apatite inclusion has been observed in plagioclase, unidentified mafic minerals, and clinopyroxene crystals.

Sample number WCH26/2-1

Rock name Rhyolite

Lithology The rock sample is very fine-grain and shows a slightly porphyritic textures. It is a grayish color with a pinkish brown weathering surface. The phenocrysts are made up of quartz (colorless) and feldspars (white) and are embedded in the very fine-grained groundmass.

Petrography

The rock sample shows a slightly porphyritic texture. The phenocrysts/microphenocrysts (4 modal %) are made up largely of quartz (2.5 modal %) with small amount of plagioclase (1 modal %) and alkali feldspar (0.5 modal %). The groundmass phase is made up mainly of quartz-alkali feldspar devitrification, with small amounts of quartz and alkali feldspar.

Quartz phenocrysts/microphenocrysts are euhedral to subhedral (sizes up to 1.25 mm across). They commonly show rounded edges and embayed outlines. Groundmass quartz is anhedral with sizes up to 0.1 mm across.

Plagioclase phenocryst/microphenocrysts are subhedral with sizes up to 0.75 mm across. Their crystals show carlsbad twin and albite twin and is slightly to moderately replaced by sericite and clay minerals.

Alkali feldspar phenocrysts/microphenocrysts are subhedral to euhedral (sizes up to 0.75 mm across). It shows simple twin and perthitic texture (sanidine type). Alkali feldspar in the groundmass

phase is anhedral with sizes up to 0.1 mm across. Alkali feldspar is slightly replaced by clay minerals. Quartz-alkali feldspar intergrowth groundmass is devitrified from glass.

Sample number WCH26/2-2

Rock name Rhyolite

Lithology The rock sample is very fine-grain and porphyritic textures. It is a grayish color with a pinkish brown weathering surface. The phenocrysts are made up of quartz (colorless) and feldspars (white) and are embedded in the very fine-grained groundmass.

Petrography

The rock sample shows a slightly porphyritic texture. The phenocrysts/microphenocrysts (6.5 modal %) are made up largely of plagioclase (3 modal %) and quartz (1.5 modal %) with small amount of alkali feldspar (0.5 modal %). The groundmass phase is made up mainly of quartz-alkali feldspar spherulitic intergrowth, with small amounts of quartz and alkali feldspar.

Plagioclase phenocryst/microphenocrysts are subhedral with sizes up to 1.5 mm across. Their crystals show carlsbad twin and albite twin and is slightly to moderately replaced by sericite and clay minerals.

Quartz phenocrysts/microphenocrysts are euhedral to subhedral (sizes up to 0.75 mm across). They commonly show rounded edges and embayed outlines. Groundmass quartz is anhedral with sizes up to 0.1 mm across.

Alkali feldspar phenocrysts/microphenocrysts are subhedral to euhedral (sizes up to 1 mm across). They show simple twin and perthitic texture (sanidine type). Alkali feldspar in the groundmass phase is anhedral with sizes up to 0.1 mm across. Alkali feldspar is slightly replaced by clay minerals. Quartz-alkali feldspar intergrowth groundmass is composed of spherulite (sizes up to 1.5 mm across). Spherulite is radial aggregate of quartz and feldspar.

Sample number WCH26/3-1

Rock name Rhyolite

Lithology The rock sample is very fine-grain and porphyritic textures. It is a grayish color with a pinkish brown weathering surface. The phenocrysts are made up of quartz (colorless) and feldspars (white) and are embedded in the very fine-grained groundmass.

Petrography

The rock sample shows a slightly porphyritic texture. The phenocrysts/microphenocrysts (12 modal %) in the sample are made up largely of quartz (8.5 modal %) and plagioclase (3 modal %) with small amount of alkali feldspar (0.5 modal %). The groundmass phase is made up mainly of quartz-alkali feldspar granophyric intergrowth, with small amounts of quartz, alkali feldspar, and opaque minerals.

Quartz phenocrysts/microphenocrysts are euhedral to subhedral (sizes up to 1.5 mm across). They commonly shows rounded edges and embayed outlines. Groundmass quartz is anhedral with sizes up to 0.1 mm across.

Plagioclase phenocryst/microphenocrysts are subhedral with sizes up to 1 mm across. Their crystals show carlsbad twin and albite twin and is slightly replaced by sericite and clay minerals.

Alkali feldspar phenocrysts/microphenocrysts are subhedral to euhedral (sizes up to 1 mm across). They show simple twin and perthitic texture (sanidine type). Alkali feldspar in the groundmass phase is anhedral with sizes up to 0.1 mm across. Alkali feldspar is slightly replaced by clay minerals.

Quartz-alkali feldspar intergrowth groundmass is composed of microgranophyric intergrowth (sizes up to 1.5 mm across). Granophyric intergrowth is made up of radial quartz embedded in alkali feldspar. Opaque minerals in the groundmass phase are anhedral and fine-grain with sizes up to 0.1 mm across.

Sample number WCH26/3-2

Rock name Rhyolite

Lithology The rock sample is very fine-grain and porphyritic textures. It is a reddish color with a pinkish brown weathering surface. The phenocrysts are made up of quartz (colorless) and are embedded in the very fine-grained groundmass.

Petrography

The rock sample shows a slightly porphyritic texture. The phenocrysts/microphenocrysts (6 modal %) in the sample are made up of only quartz. The groundmass phase is made up mainly of quartz-alkali feldspar devitrification, with small amounts of quartz, alkali feldspar and muscovite.

Quartz phenocrysts/microphenocrysts are euhedral to subhedral (sizes up to 0.75 mm across). They commonly show rounded edges and embayed outlines. Groundmass quartz is anhedral with sizes up to 0.1 mm across.

Alkali feldspar in the groundmass phase is anhedral with sizes up to 0.1 mm across. Alkali feldspar is slightly replaced by clay minerals. Quartz-alkali feldspar intergrowth groundmass is devitrified from glass.

Sample number WCH26/4

Rock name Rhyolite

Lithology The rock sample is very fine-grain and porphyritic textures. It is a reddish color with a pinkish brown weathering surface. The phenocrysts are made up of quartz (colorless) and feldspars (white) and are embedded in the very fine-grained groundmass.

Petrography

The rock sample shows a slightly porphyritic texture. The phenocrysts/microphenocrysts (11 modal %) are made up largely of quartz (7 modal %) and plagioclase (2.5 modal %) with small amount of alkali feldspar (1.5 modal %). The groundmass phase is made up mainly of quartz-alkali feldspar granophyric and spherulitic intergrowth, with small amounts of quartz, alkali feldspar and opaque minerals.

Quartz phenocrysts/microphenocrysts are euhedral to subhedral (sizes up to 1.75 mm across). They commonly show rounded edges and embayed outlines. Groundmass quartz is anhedral with sizes up to 0.1 mm across.

Plagioclase phenocryst/microphenocrysts are subhedral with sizes up to 0.75 mm across. Their crystals show carlsbad twin and albite twin and are highly replaced by sericite and clay minerals.

Alkali feldspar phenocrysts/microphenocrysts are subhedral to euhedral (sizes up to 0.75 mm across). They show simple twin and perthitic texture (sanidine type). Alkali feldspar in the groundmass phase is anhedral with sizes up to 0.1 mm across. Alkali feldspar is slightly replaced by clay minerals. Quartz-alkali feldspar intergrowth groundmass is devitrified from glass. Opaque minerals in the groundmass phase are anhedral and fine-grain with sizes up to 0.2 mm across.

Sample number WCH26/5

Rock name Rhyolite

Lithology The rock sample is very fine-grain and porphyritic textures. It is a reddish color with a pinkish brown weathering surface. The phenocrysts are made up of quartz (colorless) and feldspars (white) and are embedded in the very fine-grained groundmass.

Petrography

The rock sample shows a slightly porphyritic texture. The phenocrysts/microphenocrysts (12.5 modal %) are made up largely of plagioclase (9.5 modal %) and quartz (3 modal %) with small amount of alkali feldspar. The groundmass phase is made up mainly of quartz-alkali feldspar devitrification, with small amounts of quartz, alkali feldspar and opaque minerals.

Plagioclase phenocryst/microphenocrysts are subhedral with sizes up to 1.5 mm across. Their crystals show carlsbad twin and albite twin and are highly replaced by sericite and clay minerals.

Quartz phenocrysts/microphenocrysts are euhedral to subhedral (sizes up to 1.75 mm across). They commonly show rounded edges and embayed outlines. Groundmass quartz is anhedral with sizes up to 0.1 mm across.

Alkali feldspar phenocrysts/microphenocrysts are subhedral to euhedral (sizes up to 1 mm across). They show simple twin and perthitic texture (sanidine type). Alkali feldspar in the groundmass phase is anhedral with sizes up to 0.1 mm across. Alkali feldspar is slightly replaced by clay minerals. Quartz-alkali feldspar intergrowth groundmass is devitrified from glass. Opaque minerals in the groundmass phase are anhedral and fine-grain with sizes up to 0.2 mm across.

Sample number WCH27/5-2

Rock name Rhyolite

Lithology The rock sample is very fine-grain and porphyritic textures. It is a grayish color with a pinkish brown weathering surface. The phenocrysts are made up of quartz (colorless), feldspars (white), and opaque minerals (black) and are embedded in the very fine-grained groundmass. This sample is made up mostly of alkali feldspar.

Petrography

The rock sample shows a slightly porphyritic texture. The phenocrysts/microphenocrysts (10 modal %) are made up largely of plagioclase with small amount of quartz and alkali feldspar. The groundmass phase is made up mainly of quartz-alkali feldspar devitrification with small amounts of quartz, alkali feldspar, chlorite, and opaque minerals.

Plagioclase phenocryst/microphenocrysts are subhedral with sizes up to 0.75 mm across. Their crystals show carlsbad twin and albite twin and is moderately replaced by sericite and clay minerals.

Quartz phenocrysts/microphenocrysts are euhedral to subhedral (sizes up to 1.25 mm across). They commonly show rounded edges and embayed outlines. Groundmass quartz is anhedral with sizes up to 0.1 mm across.

Alkali feldspar phenocrysts/microphenocrysts are subhedral to euhedral (sizes up to 0.75 mm across). They show simple twin and perthitic texture (sanidine type). Alkali feldspar in the groundmass phase is anhedral with sizes up to 0.1 mm across. Alkali feldspar is slightly replaced by clay minerals. Quartz-alkali feldspar intergrowth groundmass is devitrified from glass. Chlorite patches are anhedral and fine-grain with sizes up to 0.2 mm across. Opaque minerals in the groundmass phase are anhedral and fine-grain with sizes up to 0.2 mm across.

Sample number WCH28/4

Rock name Andesite

Lithology The rock sample has a dark gray color and its surface is cover by yellowish brown materials. It has very fine-grained texture.

Petrography

The rock sample shows a slightly porphyritic texture. The phenocrysts/microphenocrysts (9.25 modal %) are made up of plagioclase (5.5 modal %) with small amount of unidentified mafic minerals (2.75 modal %) and opaque minerals (1 modal %). The phenocrysts/microphenocrysts may form as glomerocrysts and cumuloocrysts. The groundmass phase is made up mainly of plagioclase, with small amounts of opaque minerals.

Felted plagioclase grains have two grain sizes, plagioclase phenocryst/microphenocrysts are subhedral with sizes up to 1.5 mm across. Their crystals show carlsbad twin. Groundmass plagioclase is anhedral with sizes up to 0.1 mm across. Plagioclase is slightly to moderately replaced by sericite and clay minerals. Unidentified mafic minerals phenocrysts/microphenocrysts are subhedral to euhedral (sizes up to 0.5 mm across). Unidentified mafic minerals are completely replaced by serpentine/chlorite. Opaque minerals phenocrysts/microphenocrysts are subhedral to anhedral (sizes up to 0.2 mm across). Groundmass opaque minerals are anhedral with sizes up to 0.1 mm across.

Sample number WCH28/8-1

Rock name Basalt

Lithology The rock sample has a dark brown color and its surface is cover by yellowish brown materials. It has very fine-grained texture.

Petrography

The rock sample shows a slightly porphyritic texture. The phenocrysts/microphenocrysts (7.75 modal %) are made up of plagioclase (4 modal %) with small amount of opaque minerals (3 modal %) and unidentified mafic minerals (0.75 modal %). The phenocrysts/microphenocrysts may form as glomerocrysts and cumulocrysts. The groundmass phase is made up mainly of plagioclase, with small amounts of opaque minerals.

Felted plagioclase grains have two grain sizes, plagioclase phenocryst/microphenocrysts are subhedral with sizes up to 1 mm across. Their crystals show carlsbad twin. Groundmass plagioclase is anhedral with sizes up to 0.1 mm across. Plagioclase is slightly replaced by sericite and clay minerals. Unidentified mafic minerals phenocrysts/microphenocrysts are subhedral to euhedral (sizes up to 0.5 mm across). Unidentified mafic minerals are completely replaced by epidote and serpentine/chlorite. Opaque minerals phenocrysts/microphenocrysts are subhedral to anhedral (sizes up to 0.2 mm across). Groundmass opaque minerals are anhedral with sizes up to 0.1 mm across.



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Experience Summer 2012, Researcher (as scholarship student), Science Achievement Scholarship of Thailand; report submitted to Faculty of Science, Chiang Mai University

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