

EXTRUSIVE IGNEOUS ROCKS, PART 2

RHYOLITE, LATITE, TRACHYTE AND GLASSY EXTRUSIVE ROCKS

These rocks are richer in the alkali feldspars than the rocks examined in LAB 4. Rhyolite and rhyodacite (intermediate between rhyolite and dacite) are also much richer in silica than the rocks previously examined. They correspond to fields in Figure 2-3 in Winter (page 22). More information about these rocks may be found in Chapters 8-10 of Moorhouse.

Rhyodacite - Extrusive igneous. This is an older term for rhyolites whose feldspar content is one-third to two-thirds plagioclase.

Rhyolite - Extrusive igneous, sometimes hypabyssal. Aphanitic, light-colored rock which is the extrusive equivalent of granite. The color ranges from white or yellow to pink or reddish. Often porphyritic, usually containing phenocrysts of alkali feldspar (sanidine, anorthoclase, or orthoclase). Other phenocrysts include quartz, biotite, rare hornblende or pyroxene. The groundmass may be almost completely glassy; although in older rhyolites devitrification may have occurred, resulting in a fine-grained mixture of quartz, feldspar, and other minerals. Rocks commonly exhibit flow texture, including flow-banding or alignment of phenocrysts. The alkali feldspars phenocrysts formed at high temperature, followed by quick chilling. The resulting feldspars are often metastable high temperature forms such as sanidine or anorthoclase. The name, suggested by Baron von Richtofen (grandfather of the WW I aviator), is from the Greek *rhyax*, stream or torrent, alluding to a lava flow.

Trachyte - Extrusive igneous. Aphanitic, although generally porphyritic, with the phenocrysts being sanidine, anorthoclase, or soda-rich plagioclase such as oligoclase or albite. There are two types of trachyte, alkali and calc-alkali. The latter is more common and is sometimes referred to as normal trachyte. The mineralogy consists of perthitic orthoclase or microcline, oligoclase (or, rarely, andesine), diopside or diopsidic augite, and accessory quartz. Alkali trachyte is rich in sodium. The alkali feldspars are strongly perthitic or anorthoclase, and plagioclase is albite or albite-oligoclase. The mafics are iron-rich, ranging from Fe-rich biotite, amphiboles including hastingsite, arfvedsonite, or riebeckite, and pyroxenes including aegirine-augite and aegirine. Feldspathoid-bearing trachytes contain accessory feldspathoids. The name is from the Greek *trachys*, rough, in allusion to its rough appearance.

Latite - Extrusive igneous. Aphanitic equivalent of monzonite. Textures may be glassy, felsitic, porphyritic, or vitrophyric. The mineralogy consists principally of sub-equal amounts of orthoclase and plagioclase. IUGS classification is 35-65 P/(A+P), 0-10 Q. Mafics include hornblende, biotite, or augite. Similar to trachytes but the feldspar phenocrysts range from alkali feldspar to intermediate plagioclase. The name is from the location, *Latium*, an Italian province.

Quartz latite - Extrusive igneous. Similar to latite except that quartz is an essential mineral (>10% Q). Usually porphyritic.

TERMS:

The following list of terms are associated with rocks from this laboratory assignment. You will probably be familiar with some of these terms already. You should learn any terms that you are not familiar with as they may be tested on lab quizzes or the midterm.

- Agglomerate** - Consolidated pyroclastic deposit composed chiefly of volcanic bombs and subangular fragments lying in a tuff matrix. Generally refers to a chaotic assemblage of coarse angular pyroclastic materials.
- Bostonite** - A aplitic (fine-grained, light-colored) hypabyssal rock composed chiefly of alkali feldspar. The rock contains few or no mafic components, and corresponds to trachyte in composition. It is characterized by clusters of rough, irregular feldspar plates in a trachytoid groundmass.
- Felsitic** - A synonym of aphanitic, applied to light colored rocks with no visible crystals. Of or pertaining to a felsite, a rock now known to be a mixture of quartz and feldspar. Therefore, this term is not recommended.
- Ignimbrite** - Extrusive igneous. Volcanic rock formed by the widespread deposition and consolidation of ash flows and nuées ardentes, including welded tuff and sillar. (From the Latin *ignis*, fire and *imber*, shower, rain.)
- Obsidian** - Extrusive igneous. Volcanic glass with the composition of rhyolite that breaks with a fine conchoidal fracture and is black, gray, dark brown, red, or (rarely) green. Often banded. Nearly free of water, in contrast to pitchstone. (From the Latin *obsidianus*, a rock discovered in Ethiopia by Obsidus, ca. 280 B.C.).
- Palagonite** - Extrusive igneous, weathered. Altered, hydrated equivalent of basaltic glass, often yellow or orange, and composed of glass remnants, cryptocrystalline material, microlites of augite, olivine, and labradorite, and secondary clays, zeolites, carbonates, and chlorites. (From the location, Palagonia, Sicily).
- Pearlite** - Extrusive igneous. Also spelled perlite. Volcanic glass having the composition of rhyolite, and a higher water content (to 4%) than obsidian. Colorless, gray, blue, green, red, or brown. Often shows numerous concentric cracks, with onionlike partings, which impart a pearly luster. May have been derived from obsidian through hydration by meteoritic water.
- Pitchstone** - Extrusive igneous. Volcanic glass chemically similar to rhyolite except for higher water content, 4-10%. Exhibits a pitchlike luster. Color may be black, gray, olive green, brown, or red. Fracture is conchoidal.

- Pumice -** Extrusive igneous. A frothy, light-colored rock with a composition near rhyolite. It may form as crusts on more compact lava, or may occur in volcanic ejectamenta. The glassy material is filled with so many small air bubbles that pore space may be much greater than the glass volume. The rock has low specific gravity, often floating on water. (From the Latin, *pumicis*, perhaps from *spuma*, foam).
- Pumicite -** Extrusive igneous. Synonym of pumice.
- Sillar -** Extrusive igneous. Type of ignimbrite from an ash cloud or nuée ardente, indurated by recrystallization due to escaping gases, rather than by welding.
- Trachytoid -** Igneous, phaneritic. A textural term derived from trachytic texture of some lava flows. In such rocks, the feldspars have a parallel or sub-parallel orientation. The term is now used for all similar textures, regardless of composition.
- Tuff -** Extrusive igneous. A general term for consolidated, pyroclastic rocks, especially those whose fragments are less than 2 mm across. The IUGS definition is a pyroclastic rock whose average pyroclast size is less than 2 mm. Course tuff is 1/16 mm to 2 mm, while fine (or dust) tuff is less than 1/16 mm.
- Tuffaceous -** Said of sediments containing up to 50% tuff.
- Vitrophyre -** Extrusive igneous. Volcanic glass containing phenocrysts. The composition is rhyolitic. The phenocrysts include quartz, sanidine, minor plagioclase (usually clear), and lesser amounts of augite, hornblende, or biotite. The most common variety is pitchstone vitrophyre. Obsidian, perlite, or pumice vitrophyres are also possible. (From the Latin, *vitrum*, glass and porphyry).
- Volcanic conglomerate -** Sedimentary. Conglomerate composed of over 50% water-deposited volcanic pyroclastic boulders and pebbles showing some effects of erosion.
- Welded Tuff -** Extrusive igneous. Siliceous tuff indurated by the welding together of glass particles under the combined action of heat retained by the particles, the weight of overlying materials, and hot gases. Welded tuffs are often banded or streaked.
- Xenolith -** Igneous, sedimentary, or metamorphic. Fragment of a foreign rock, or of an earlier crystallized portion of the same magma, enclosed in igneous rock. (From the Greek *xenos*, foreign or guest and *lithos*, stone).

Assignment:

1. Examine any two of rocks number 10, 11, 12, 16, or 23 in thin section (do not examine two of the same type or rock, e.g. 10 and 11). Prepare a labelled sketch of each selected thin section, being sure to label the sketch with magnification and either CN or PP. Identify the major minerals, and write a concise description of the petrography (macroscopic and microscopic) of the rock. This will be handed in at the beginning of the following lab.

Be sure to do an interference figure for at least one mineral, and show the figure you obtain to the GTA.

Examine all of the rocks in hand specimen. The following rocks from Wards North American Rock Set are particularly good type examples. Be prepared for a lab midterm on the rock samples and the terminology in this laboratory after lab 8 is graded and returned.

Number	Name
8	Obsidian
9	Pumice
10	Rhyolite tuff
11	Rhyolite
12	Rhyolite porphyry
16	Trachyte porphyry
23	Latite porphyry
34	Scoria

The following samples from other sources are also good examples.

331	Quartz Latite Porphyry
332	Volcanic conglomerate
333	Volcanic breccia - MISSING
349	Quartz Latite, Ignimbrite

Additional samples of various rocks, illustrating many of the terms described, are also available in the lab, and should be examined.

Banded Obsidian
Rhyolite obsidian
Obsidian Pitchstone
Pitchstone
Perlitic Vitrophyre
Commercial perlite
Fibrous glass
Dense Pumacious glass
Rhyodacite
Red volcanic ash
Palagonite tuff
Lithic tuff (containing xenoliths)
Bishop tuff
Dacite-Andesite tuff breccia
Rhyolite welded tuff

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