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Vitrophyre Rhyolite in Valles Caldera

Vitrophyre Rhyolite is a type of igneous rock found in the Sante Fe and Valles Caldera areas of New Mexico (see map). Rhyolites are the extrusive equivalents of the plutonic rocks and hence the Rhyolite outcrops closely resemble granite formations. They are composed of high content of Silica and low in iron and magnesium. The Rhyolite melts are intensely polymerized and their lavas are very viscous. The Rhyolites are also known to occur in volcanic plugs and dykes.

Figure 1. The cross sections and the geological maps of the Vitrophyre Rhyolite is shown above.

The Rhyolites of the Oligocene intrusives commonly contain 10 percent phenocrysts which are set in altered cryptocrystalline groundmass. A variety mosaic of grainy crystalline material make in the order of 0. 01 – 0. 1 mm across makes the groundmass. Certain specimens also have been found to have microgranophyric groundmass too.

Some specimens also have brown glass groundmass containing microlites that are glow aligned. Quartz is present as euhederal grains that are partly resorbed. Plagioclase and potassium feldspar are also seen to be present consistently across all the specimens.

Reclits in a few specimens also indicate that plagioclase is albitized form an oligoclase or andesine. More of potassium feldspar is seen predominantly than orthoclase and at the same time it is not even determinable in a few

specimens and sites. The chemical difference between vitrophyre and an altered devitrified rock which could be genetically related is found to be extremely difficult to interpret. The devitrified rocks contain lesser CaO and Na2O and more of SiO2 and K2O than the Vitrophyres.

The origins of can be traced back to the Owyhee Plateau closely where Idaho, Nevada and Oregon meet. The massive volcanism there started off as the yellow hot spot. With passage of time the North-America moved southwestward and the hotspot then cut across Northwest of Wyoming and southern Idaho that witnessed very recent volcanism less than a million years ago.

There were three (3) rhyolite eruptive units totaling 3 km3 dense rock equivalent volumes that are the youngest products from the Valles caldera, New Mexico. The pyroclastic and effusive units were also known as El Cajete Series. These Plinian eruptions happened over a significant period of time. It was an ignimbrite-forming activity before an over the top phase by a long but predictable period. The reason why it formed the El Cajete Plinian deposit (about 1. 3 km3) is due to the explosive phases with minor dry pyroclastic surges, the Battleship Rock tuff (about 1. 0 km3) and a valley-confined welded ignimbrite. The Plinian eruption column was estimated to have been 28 km high during deposition of the most widely dispersed pumice fall unit. Slow effusion of the Banco Bonito obsidian lava flow (<1. 0 km3) onto a dissected surface cut into the El Cajete and Battleship Rock pyroclastic deposits, accompanied by minor explosive activity, terminated the event. There were 24 rock samples from the entire eruptions that exhibit little significant variation, and the 3 units are petrographically not the same arising from contrasting eruptions. There were also very few phenocrysts

appeared to have a balance with their enclosing high-silica rhyolitic liquid. The plagioclase grains were resorbed, while biotite and hornblende occurred most of the time in collective grains in the textures characteristic of plutonic rocks can be distinguished. These characteristics were the effect of one-sided melting of pre-existing crustal igneous rock and succeeding eruption of the liquid plus restite crystals. The rapid generation and eruption of rhyolitic magma during the most recent stage of activity in the Jemez Mountains may imply that the Valles magma system is presently in a state where small magma bodies are transient phenomena (Self, et. al., 1988).

About 16 million years before the Timber Mountain area is estimated to be a basin type block faulted mountains with low relief and separated by valleys of alluvium and tuff. The youngest among these tuffs – the calc-alkalic Fraction Tuff is a little more than 16 million years old. It then flowed into the ancestral valleys of the area from the vents in the North. The earliest volcanic activity in the caldera complex was seen to be the eruption of hornblende bearing calc-alkalic ash flow containing subordinate Rhyolite lavas. This must have been possibly related to the Sleeping Butte Caldera that is exposed to the Northern Oasis Valley. This must have been about 1400 km3 of tuff that got deposited within the Oasis valley Caldera complex. The Crater Flat Tuff’s Bullfrog member is seen to be the most extensive and extends into the Death Valley on the west side. The eruptive events have been estimated to have taken place around 16 to 14 million years back.

A significant collapse seem to have occurred in the Silent Canyon Caldera around 13. 8 million years ago coinciding with the eruption of Peralkaline Grouse Member part of the Belted Range Tuff. Following these eruptions the Silent Canyon Caldera is seen to be the source of Calc-alkalic rocks. The

Vitrophyre Rhyolite the Rhyolite sheets are apparent with a spot of vitrophyre. There is a distinct difference in color and the glassy layers are clear and evident in the specimen. The black vitrophyre is also exhibited. both the components of the rock have their origin in the same magma and the difference is due to the rate of cooling.

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