The Rhyolites of Oklahoma

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Introduction

Three rhyolites in Oklahoma have been named and described, the Colbert porphyry of the Arbuckle Mountains and the Carlton and Saddle Mountain rhyolites of the Wichita Mountains. Recent study and re-examination of these surface exposures and samples from the subsurface east of the Wichita Mountains revealed new information which has changed the concept of the character, extent, and origin of the rhyolites.

Exposures of the rhyolite have been described by Taff (1904), Taylor (1915), Hoffman (1930), Uhl (1932) and Schoonover (1948), but several areas of outcrop have never been mapped or described in detail.

Mineralogy and Textures

The granophyric texture of the Wichita rhyolites has been emphasized by Hoffman. Examination of samples from several surface and numerous subsurface locations indicates this texture is a local feature. The Saddle Mountain is typically granophyric and recent investigation indicates this is a gradational phase of the "Lugert" granite.

The Carlton is a typically porphyritic and locally perlitic rhyolite with major phenocrysts of microperthite and minor phenocrysts of quartz, orthoclase, sodic plagioclase, and magnetite. The groundmass is micro- to cryptocrystalline and occasionally a micrographic intergrowth of quartz and feldspar. The potash feldspars are typically kaolinized and contain

finely-disseminated hematite imparting a reddish or pink color, while the sodic plagioclase is more often clear and sericitized. Chlorite is the most abundant secondary mineral, invading phenocrysts, replacing femic minerals and occasionally dominating the groundmass with finely-disseminated shreds.

Origin and Correlation

Granitic and gabbroic rocks comprise the majority of igneous outcrops in the Wichita Mountains. The rhyolites make up a rather small portion of the exposures and are restricted to the eastern part of the mountains. In the subsurface of Comanche County this situation is reversed and the rhyolitic rocks predominate. Granite was penetrated in only one well for which samples were obtained and none penetrated mafic rocks. This granite is a later intrusion into a thick sequence of rhyolitic and spilitic volcanics.

Hoffman (1930) considered the Wichita rhyolites to be intrusive sills, an interpretation that has been widely accepted. However, widespread occurrence of volcanic material in the subsurface indicates the sill interpretation of the rhyolites is incorrect, though some may be sill-like in character. The largely extrusive rhyolites contain interbedded meta-sediments and pyroclastics. These rocks range from an agglomeratic pyroclastic, and welded tuff to low-grade argillites and meta-graywackes. Below the rhyolites are spilitic lavas, basalts, andesites, and interbedded clastics. This spilitic suite has not been mapped from surface exposures but two deep wells have penetrated these rocks under thick acidic volcanics. All these volcanic rocks have been grouped in a subsurface petrographic province, the Oklahoma volcanic terrane. (Denison 1958).

Flawn (1956) did not correlate the Oklahoma rhyolites with the subsurface Panhandle volcanic terrane, but in view of later information he now considers the Oklahoma volcanics essentially equivalent to those of Texas (Personal communication 1958). The Panhandle terrane is composed of largely extrusive rhyolites and related rocks and covers two large areas in Texas and eastern New Mexico.

Subsurface information shows the Wichita rhyolites extend eastward to central Stephens County and barring some drastic change within the Anadarko-Ardmore basin they are equivalent to the exposures of the East and West Timbered Hills porphyry of the Arbuckle Mountains. There is no mineralogic or textural difference between the rhyolites of these two southern Oklahoma structures.

The rhyolites are characterized by their diversity and unpredictability. At the present time there has been no successful correlation of distinctive rhyolite intervals for as much as a mile and it is not possible to predict the type of rhyolite to be encountered at a given location. This diversity is probably due to the large number of source vents required to extrude viscous acidic lavas over such a wide area. Each feeder probably had slightly different characteristics due to local contamination and varying temperatures.

Relative Age of the Rhyolites

Rhyolites from surface and subsurface information appear to be both younger and older than the Wichita granites, early rhyolites being older and those extruded toward the end of the lava cycle being younger than the granites. It is difficult to imagine the vast volume of acidic lavas extruded without a nearby abyssal granite source. It is the writer's opinion the Carlton is the surface equivalent of one of the Wichita granites. The age relationship between the extrusives and the gabbroic rocks is not

shown in surface exposures or from subsurface information. Indirectly, if the rhyolites are both younger and older than the granites at least some of the rhyolites should be later than the gabbros for the granites are younger than the mafic rocks.

Outcrops of the East and West Timbered Hills porphyry are isolated and no age relationship can be inferred with respect to the granites of the Arbuckle Mountains.

Summary

Though a comparatively small outcrop component of the igneous rocks of Oklahoma the rhyolites dominate the subsurface between the Arbuckle and Wichita Mountains. These rocks are largely extrusive and appear to correlate with volcanics in Texas and eastern New Mexico, though not in a continuous band. The subsurface limits of the rhyolite have not been defined west of Comanche County and considering the sparsity of surface exposures it is doubtful that the rhyolites will dominate the subsurface.

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