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GEOLOGIC FEATURES OF THE SOCORRO PERLITE DEPOSIT

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The Socorro deposit of the Great Lakes Carbon Corporation was the first commercial source of perlite to be placed in production in New Mexico. For several years during the period of active production from 1949 to 1961, it was the leading domestic source of crude perlite aggregate.

The deposit has the form of a volcanic dome approximately 2000 to 2600 feet in exposed horizontal diameter, and an exposed vertical extent of more than 450 feet. The eastern and western margins are bounded by high-angle normal faults of northerly trend, between which the perlite body occupies the position of a horst block. To the north and south, the perlite is overlain by a sequence of vitric breccias, and massive to thin-bedded, weakly to highly indurated vitric tuffs that grade upward into clays, sands, gravels, and their indurated equivalents. The vitric tuffs and breccias are composed largely of angular fragments of glass identical with that of the perlite dome, plus fragments of older volcanic rocks of rhyolitic to andesitic composition that crop out in the vicinity. These pyroclastics clearly point to an explosive episode during the eruptive history of the parent volcano that was the source of the perlite. It is not clear, however, whether this episode was an initial one (as is common in a number of deposits in the state), with subsequent eruption of the dome into or through the tuff blanket, or whether the tuff represents a final pulse after emplacement of the dome. No post-dome vent has been recognized, but marginal relationships are obscured by subsequent faulting and sedimentation. The entire sequence was faulted, beveled by erosion, and covered by a thin sheet of Quaternary(?) olivine basalt that issued from vents about four miles west of the deposit. Minor Recent faulting displaced the basalt and adjacent gravel aprons.

The "perlite" is not perlitic; hence, the term is used only in an industrial, genetic, and compositional sense. It consists of a relatively uniform pale gray to buffish gray, prominently flow-banded, moderately pumiceous glass of rhyolitic composition. Scattered phenocrysts of quartz, oligoclase, and sparse biotite comprise only about 1 to 1½ percent of the rock by volume. A chemical analysis is shown below:*

SiO_2	73.20 percent
Al_2O_3	12.17
Fe_2O_3	0.75
FeO	0.30
MnO	0.08
MgO	0.13
CaO	1.08
Na_2O	3.12
K_2O	5.16
TiO_2	0.13
P_2O_5	0.02
H_2O-	0.26
H_2O+	3.36
Total	99.76 percent

* H. B. Wiik, Analyst.

The highly siliceous rhyolitic composition is characteristic of the four other available analyses of volcanic glasses from New Mexico with physical characteristics and water contents ranging from obsidian (0.37 percent total water) through structurally classic perlite (3.74 percent total water), to slightly perlitic pitchstone (8.95 percent total water). When recalculated to anhydrous rock to eliminate the variable water content, the silica contents range only from 76.14 to 76.80 percent. These limited data indicate the importance of high silica content in the formation of large masses of volcanic glass.

A small zone exposed in the floor of the main canyon immediately north of the open pit (Stop 1, Trip 1), differs from the major part of the mass by being highly perlitic and nonvesicular, perhaps as a result of its greater depth where confining pressure inhibited expansion of water vapor and other volatiles that produce vesiculation. The possibility cannot be rejected that the perlitic mass represents an injection of a more viscous phase, in which diffusion of volatile molecules to form vesicles was impeded by viscosity, just as normal crystallization must be impeded by the low rate of diffusion of rock-mineral ions during the necessarily slow cooling of all large bodies of volcanic glass.

Another segment along the northeastern margin of the deposit contains intercalated lithoidal flow bands and small zones of pure, white montmorillonite. The montmorillonite is evidently a product of hydrothermal alteration of the glass. Weak alteration and local joint coatings and stains of manganese oxides are recognizable in several other small parts of the deposit. Manganese oxides are particularly conspicuous on the face of the ledge at the eastern side of the open pit at Stop 1.

The internal structure of the dome is clearly reflected by the attitude of pronounced flow banding, which at most places dips at high angles. Vertical dips are conspicuous in several segments of the mass. These features point to predominately upward flow during emplacement and suggest that most of the presently exposed sections are within the throat of the vent. The mass is highly jointed, and open tension fractures that transect the flow banding at angles clustering about 90 degrees are conspicuous. Local zones of autoclastic brecciation, with some rotation of the blocks, are particularly conspicuous in the upper part, pointing to high viscosity before all movement by flowage had ceased.

Specific age criteria based on stratigraphic relationships are largely lacking, but the Socorro deposit was considered by the writer to be assignable to a post-Datil epoch of rhyolitic volcanism that has been recognized at several places in the Datil–Mogollon volcanic field to the west. These rocks, at least locally, interfinger with conglomeratic sediments that have been assigned to the Santa Fe Group and the Gila Conglomerate. K-Ar analyses by W. A. Bassett (Weber and Bassett, 1963) provided age values averaging 14 million years for a perlite southwest of Magdalena and of 18.6 million years for obsidian southwest of Glenwood, which is in accord with indicated field relationships with volcanic rocks of the Datil Formation, a post-Datil major unconformity, and partial time equivalence to conglomerates of Santa Fe–Gila aspect. A sample of the perlite from the Socorro deposit, however, gave inconsistent and apparently unreliable ages of 23.7 and 33.2 million years, the significance of which is not known at this time. That these figures bracket the ages obtained for the Datil Formation in the same series of analyses perhaps should not be ignored.

REFERENCES CITED

Weber, R. H., and Bassett, W. A. (1963) *K-Ar ages of Tertiary volcanic and intrusive rocks in Socorro, Catron, and Grant counties, New Mexico*, in this guidebook.