THE UNIVERSITY OF TEXAS
BUREAU OF ECONOMIC GEOLOGY

MINERAL RESOURCE CIRCULARS
NO. 2

Typeset from original stencil, July 1980

Volcanic Ash in Texas

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December, 1931

Volcanic ash is a form of rock deposit composed of small, sharp, angular grains of volcanic glass, forming ordinary sedimentary beds. Other names applied to volcanic ash or its varieties are volcanic dust, volcanic tuff, and pumicite. Volcanic dust is volcanic ash of fine texture. Volcanic tuff is a term usually applied to the older, more or less compacted, deposits of volcanic ash. Pumicite is a more or less finely divided powder or dust made up of small, sharp, angular grains of volcanic glass of about the same composition as pumice. The terms pumicite and volcanic ash practically mean the same thing. Pumice, often associated with volcanic ash, is a highly vesicular or cellular, glassy volcanic lava, usually rhyolitic in composition. Fragments of pumice, of various sizes, and of more compact lavas as well, are often deposited with volcanic ash. Volcanic ash may have various other impurities, such as clay, sand, gravel or boulders. It is often cemented to a more or less hard, dense mass by calcium carbonate, iron oxide or silica. It is sometimes highly altered through the action of hot vapors or hot waters. Cold waters also alter it greatly and probably cause its change to bentonite, although it is also possible that hot mineralized waters or vapors sometimes form bentonite from volcanic ash.

Volcanic ash is formed by the violent and explosive action of volcanoes, which throw it out in great clouds. Its eruption is accompanied by the emission of great quantities of steam and other gases. Sometimes there is so much steam or hot water accompanying the ash that great semi-liquid mud flows rush rapidly down the slopes of the volcano, overwhelming and destroying everything in their path. The acidic or more viscuous volcanic rocks, which melt at higher temperatures, form most of the ash, but more basic rocks, such as basalt, at times form large deposits.

No doubt the ash is partly formed by the comminution of rocks and crystals by friction during the explosion, but a great part of it represents lava blown out from the volcanic vent in liquid form and solidified almost instantaneously in the air. It doubtless solidifies as glass, but may be subsequently devitrified, that is, crystallized into the various minerals characteristic of volcanic rocks. These crystals are generally very minute and can be seen only under the microscope.

The particles of volcanic ash may be shreds, or very angular, concoidally-fractured flakes with the sharp edges of broken or ground glass, or may be long tubes or fibres. All these particles are often hollow and originally contained bubbles of steam or other gas. In fact, the expansion or explosion of the bubbles of gas causes a great deal of the shattering found in the glass particles. The coarser particles may be drop-like, with a central cavity or vesicle. The glass particles are either colorless and transparent or have a brown tint; subsequent alteration may, however, produce other colors. Most deposits of pure volcanic ash have a whitish or light gray color. Pure (unaltered) volcanic ash has a gritty feel when rubbed between the fingers and does not adhere like clay.

Ash from volcanic explosions is sometimes transmitted long distances through the air. That from Aleutian Islands volcanoes has at times fallen as far away as Portland, Oregon, and the fine dust-like particles from the great explosion of Krakatoa, in the Straits of Sunda, East Indies, projected into the upper atmosphere, travelled three times around the earth, and settled in some quantity everywhere along its path. Consequently volcanic ash beds may be found hundreds or even a thousand miles from their volcanic source. Fairly thick ash beds, quite pure, sometimes rapidly accumulate in lakes, bays, seas, or other bodies of water, into which they have been washed from land surfaces by rains subsequent to the settling of the ash from the air. The eruption of Santa Maria volcano in Central America blanketed the surrounding country with ash like a heavy fall of snow, yet six months later nearly all of it had been washed away by the streams.

A single ash-fall may cover a large extent of country and, if deposited on flat lands or in a large body of water where it is preserved until later covered by other materials, may make one of the most definite of geologic horizons, and one which we may be fairly certain was deposited at the same time everywhere it is found. For this reason, volcanic ash deposits are often of great value in correlating geologic strata, either on the surface or in underground borings.

Volcanic ash or pumicite has a number of uses. A large amount is mixed with small amounts of soap powder, soda ash (carbonate of soda) or other ingredients to make cleansing compounds. It is also used in abrasive hand soaps, mechanics' paste soaps, silver and other metal polishes; in dustless sweeping compounds (which consist primarily of sawdust soaked in paraffin oil, to which salt has been added to render them hygroscopic); as a filler for paint; as an abrasive in rubber erasers; for both hot and cold insulation; in tooth pastes and powders; and for polishing, cleaning or scouring many different substances. Some volcanic ash has been used in California, and perhaps elsewhere, as "fuller's earth" in the refining of petroleum. Perhaps the ash so used is partially altered to bentonite or some other absorbent material. For many purposes a fairly uniform size of grain is essential.

One of the historic uses of volcanic ash is its conversion into the famous Roman hydraulic cement called Pozzuolana. This cement is made by mixing slaked lime with volcanic ash or blast-furnace slag. The mixture is finely ground but is not burned after mixing. When mixed with water, it will set like natural or Portland cement and is better adapted for use under water than in air. It weighs less than Portland cement. Pozzuolana was the material used in the Roman walls, aqueducts, and historic buildings. The Pantheon, erected of it 2000 years ago, stands intact today.

About 40,000 tons a year of volcanic ash, valued at two to three dollars per ton, are produced in the United States. The United States in 1929 produced 60,873 short tons of pumice and pumicite, valued at $318,579. It is found in every state west of the Mississippi River, but the main production is in Kansas and Nebraska.

Volcanic ash is widely distributed in Texas. Great quantities are found in all the mountain counties which lie south of the line of the Texas and Pacific Railway in Trans-Pecos Texas. Deposits are known in the Panhandle High Plains and the Staked Plains and in the counties to the east (Kent, Wilbarger, Dickens, and Baylor counties). Ash is found in many of the counties of the Gulf Coastal Plain. Many of the Coastal Plain ash deposits are in part or wholly altered to bentonite.

The unaltered volcanic ash of Texas is of Tertiary and Quaternary age. The formations of the Gulf Coastal Plain which contain it in most abundance and in the thickest beds are the Fayette and Jackson of Eocene age and the Catahoula (or Gueydan or Corrigan) of Oligocene or Miocene age. There were originally volcanic ash deposits in the Cisco formation of Pennsylvanian age and in the Permian as well as in the Upper Cretaceous formations, but all of those now known have been altered to bentonite.

Pure volcanic ash of Pleistocene age in a bed 7 feet in thickness is found on the north side of Tule Canyon at the Swisher-Briscoe county line. A bed reported to be some 10 feet in thickness and extending over many acres is found along Duck Creek southeast of Spur in Dickens County. On the same creek, in Kent County, a bed of Pleistocene age, 18 feet thick, is known. A bed of Pleistocene age is found at Red Bluff, on Red River, in Wilbarger County. A bed about 7 feet thick, of Lower Pliocene age, is situated in the northeast corner of Section 59, Block A-2, in Hemphill County. It is estimated that about 46,500 cubic yards of mostly fine-grained ash is available in the last-noted deposit. Volcanic ash is reported from Baylor, Taylor, and Lampasas counties.

Among the counties of the Gulf Coastal Plain which beds of volcanic ash have been found are Tyler, Polk, Trinity, Brazos, Washington, Fayette, Karnes, and Starr. It is probable there are beds of ash in a number of other counties also.

In Starr County, east, north, and south of Rio Grande City, there is a belt of very soft and powdery, somewhat limy, pinkish-white volcanic dust or tuff. The belt is over three miles wide but good exposures are not common. Estimates of the thickness of ash here very from 60 to 200 feet. There is an excellent exposure of the ash in this belt on the north side of the Loma de la Cruz, 3 miles east of Rio Grande City.

A deposit a short distance north of Millican, Brazos County, is of very fine texture, suitable for metal polish. An ash bed, 15 to 20 feet thick, outcrops on the Brazos River 5 miles west of Millican and one mile above the mouth of Boggy Creek. A bed six feet thick of white volcanic ash is found at Sulphur Springs, 5 miles north of Chester in Tyler County. At Chalk Bluff, northeastern Polk County, there is a bed of medium-grained ash, 8 feet thick. Around Potomac, in Polk County, are deposits 5 feet and more in thickness. There are a number of exposures in the vicinity of Corrigan, Polk County.

There are also deposits in the neighborhood of Piedmont Springs and two miles east of that place in Grimes County. These deposits are 4 to 5 feet in thickness. There is a bed 2 feet thick on Chalk branch one mile west of Kellum Springs, Grimes County. The ash is also found at other places between Piedmont and Kellum Springs. Five miles northeast of Kellum Springs, near Union Hill church, there is a deposit over 20 feet thick covering nearly 10 acres. There are also a number of exposures in the vicinity of Singleton, Grimes County.

There are a number of exposures in southern Trinity County among which are a bed 8 feet thick just north of mile post 16 on the International and Great Northern Railroad and exposures on White Rock Creek east of the town of Trinity. There are also deposits in northern Walker County. In the general area between the Trinity and Neches rivers there appear to be two horizons of volcanic ash in the Jackson formation and a large quantity of it in the Corrigan or Catahoula formation.

Volcanic ash is generally worked in open cuts, from which overburden or other unsaleable material must sometimes be removed. Much of the pumice, the main source of the best grade of which is the Island of Lipori in the Mediterranean Sea, is mined in underground workings.

Volcanic ash must be of uniform texture and unmixed with other material for a number of uses. The cost of transportation, milling, and purifying—if the two latter processes are necessary—must be kept low. Although the deposits are known to be large no volcanic ash is now being produced in Texas.

Notes added January, 1932

A deposit of volcanic ash said to cover an area of 350 acres and to be from 2 to 15 feet thick, is found one mile from Skeen station in Lynn County. Volcanic ash, at least 4 feet in thickness, outcrops along Spring Creek, 4½ to 5 miles southwest of Spur, Dickens County.

Volcanic ash of suitable composition can now be used in large amounts in the ceramics industries. An analysis of an ash in California used for a new and desirable type of chinaware is as follows: silica (SiO_2), 78.55%; alumina (Al_2O_3), 12.73%; ferric oxide, 0.17%; titanium oxide (TiO_2), 0.10%; lime (CaO), 0.30%; magnesia (MgO), 0.20%; potash (K_2O), 5.27% soda (Na_2O), 0.32%; loss on ignition (water), 2.10%. Volcanic ash for this purpose should be as low as possible in iron oxide, lime, and magnesia. It is the content of potash and soda in the above analysis which makes it possible to replace the usual feldspar entirely and which is the significant part of the material in connection with the high silica content.