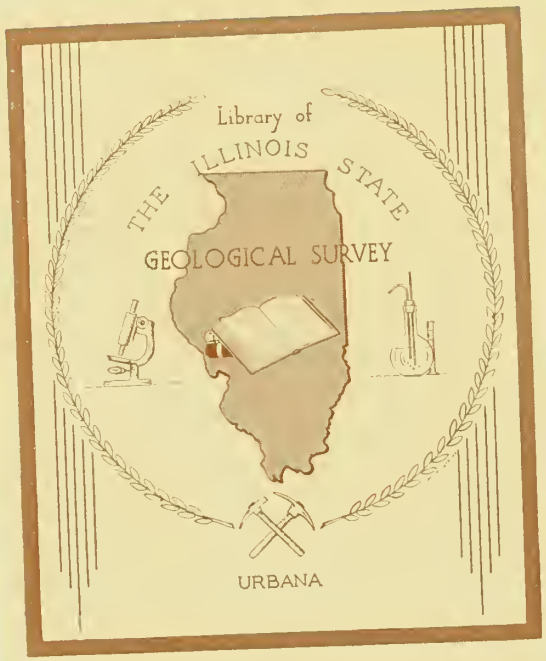

ILLINOIS STATE GEOLOGICAL SURVEY
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John C. Frye, Chief

ILLINOIS INDUSTRIAL MINERALS NOTES

Number 1, December 1, 1954

Prepared by the Industrial Minerals Division
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This is the first of a series of newsletters which we plan to send you from time to time, dealing with the broad field of industrial minerals as defined for Survey purposes to include limestone, dolomite, sand and gravel, silica sand, fluorspar, zinc and lead ores, "amorphous" silica, ganister, novaculite, and peat. In these letters we will discuss the results of lesser investigations which are not sufficiently important to merit regular Survey reports, cite interesting by-products of Survey research on industrial minerals, indicate the nature of work in progress in the Industrial Minerals Division, and note articles from uncommon or foreign literature sources which may be of interest to the industry of Illinois. We welcome your comments and criticisms.

Potash feldspar has been found in the Glenwood formation where it crops out in the vicinity of Oregon. There the formation reaches a maximum thickness of about 25 feet and is made up of sandstone, shale, and dolomite; sandstone makes up more than one-half of the formation in some places. Some of the sandstone contains potash feldspar; one sample analyzed 6.71% K_2O, others gave smaller percentages. Some of the shale also contains feldspar, together with a green clay mineral which is 6-7% potash. Analyses of four shales fall between 3.46 and 7.39% K_2O.

Hydrogen sulfide, the malodorous gas characteristic of rotten eggs, is the cause in part at least for the fetid odor which accompanies the crushing of some Illinois limestones. It is thought that hydrogen sulfide gas is dissolved in numerous microscopic fluid inclusions in the crystals of the limestone. Crushing breaks into these inclusions and liberates the dissolved gas.

Organic material is largely the cause of the gray or dark gray color in Illinois limestones. A preliminary investigation by means of differential thermal analysis, which indicates how the organic material burns, closed-tube tests, which are a crude type of distillation test, and determination of carbon-hydrogen ratios suggest that this material is of two kinds. The most common type of organic material appears to be metamorphosed woody plant

remains; less common is a black organic material probably derived from a petroliferous substance.

Fly ash is produced in coal-burning installations in the Chicago area in quantities of several hundred thousand tons yearly. The British magazine Colliery Guardian, August 26, 1954, reports the successful experimental use of fly ash with the addition of 15% clay for making brick and also the production of a lightweight aggregate from it by a pelletizing procedure. Question: Could the fly ash with some clay added to it be used to make lightweight aggregate by conventional methods?

A preliminary investigation of the sandstones of southern Illinois as sources of industrial sand is in progress. Field work was done last summer; more than 300 samples were taken from 25 outcrops. The samples are now being tested and analyzed, and we hope to have a report published by spring. The sandstones range from very fine to coarse grained. No "round grain" sandstones were found; some of the sandstones have sub-rounded grains.

Mapping of the structure, or "lay," of the rock formations in the zinc-lead district of northwestern Illinois, which was continued during the summer and fall, has given a better understanding of geological conditions and their relationship to ore occurrence. Geochemical prospecting by the dithizone method of testing soil for traces of zinc or lead was unsuccessful in pinpointing known ore deposits. There are indications, however, that it may be an aid in delineating areas of mineralization.

In discussing fine mineral powders the term micron is commonly used for describing the sizes of the particles. It is a unit of length equal to 1/1000 of a millimeter, or 39/1,000,000 (.000039) of an inch. The abbreviation for micron is the Greek letter mu, also written μ. By way of comparison, the opening in a 200-mesh wire sieve is 74 microns square. Lately the term millimicron has been appearing with increasing frequency. It is expressed in abbreviated form as mu mu and is 1/1000 of a micron, or 39/1,000,000,000 of an inch (.000000039). Another term, Angstrom unit, or simply Angstrom, is also used; it equals 1/10,000 of a micron.

A limestone about 10 feet thick containing a wax or resin which gives it a brown color occurs in Calhoun County near Batchtown. The thin shale partings between the limestone strata burn readily. If the carbonate material is removed from the limestone with acid, the remaining insoluble material also will burn.

CAPSULE REPORT

Heavy minerals in Illinois glacial sands

Raymond S. Shrode*

The attention of many operators of sand or gravel pits has been attracted by concentrations of black or reddish sand grains in the pits.

* Friends of Mr. Shrode will be interested to know that he has left the Survey and is now on the geological staff of Diamond Alkali Company, Cleveland.

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These minerals are called "heavy minerals" because they are heavier than the mineral quartz, which makes up the bulk of the grains in Illinois glacial sands. Most of the sands and gravels of Illinois are directly or indirectly related to deposits made by the great glaciers which extended southward over Illinois from the north.

To determine whether the heavy minerals in Illinois glacial sands are of potential economic importance, 18 samples were obtained from diverse types of deposits well distributed throughout the State. Included were dune sands, river sands, beach sands, and outwash sands.

Principal heavy minerals in the order of their average abundance were:

Black nonmetallic silicate minerals: Composed commonly of varying proportions of calcium, magnesium, and silica. They are not known to have commercial use.

Garnet: Generally pink or red grains; a silicate mineral of complex composition. Some garnet is used as an abrasive.

Ilmenite: Black grains; ferrous titanate ($FeTiO_3$). An ore of titanium. Some of the ilmenite contains more iron than is normal.

Magnetite: Black, magnetic grains composed of iron sesquioxide (Fe_3O_4); an ore of iron. Some of the magnetite grains contain titanium.

In most samples the amount of heavy minerals is less than 2 percent by weight. The black nonmetallic silicate minerals comprise about 2/3 to 3/4 of the total heavy minerals. Greatest concentrations of heavy minerals were found in Lake Michigan beach and dune sands near Zion.

The average composition of 15 samples of sand, excluding samples from Zion area not known to represent sand in quantity, is as follows:

	By weight
Black nonmetallic silicate minerals and other minerals present in very small amounts	1.4%
Garnet	0.3%
Ilmenite	0.2%
Magnetite	0.1%

Most of the heavy mineral grains were finer than 60 mesh.

The amount and character of the heavy minerals in the glacial sands tested suggest that generally they are probably not of commercial importance at present.