INSOLUBLE RESIDUES OF THE LEVIAS AND RENAULT FORMATIONS IN HARDIN COUNTY, ILLINOIS*

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During recent work of the Illinois State Geological Survey in Hardin County, Illinois, it was found desirable to determine zones in the Renault formation and to make more definite separation of the Levias member of the Ste. Geneiveve formation from the overlying Renault formation than has heretofore been possible. Inasmuch as both the Renault and Levias formations are dominantly limestone, the method of study by means of insoluble residues is well suited to the problem. This study is by no means complete, but the data presented in this paper have proved valuable in the work of identifying the stratigraphic positions of limited outcrop sections and diamond-drill cores of these two formations. This in turn assists in the determination of the throw of some normal faults cutting these formations. The general practice in angle-drilling for vein deposits of fluorspar is to drill but a few feet beyond the fault. Rarely is this far enough to penetrate a contact of two formations. Thus by zoning formations one can easily determine the exact throw of the fault.

Samples were obtained both from outcrops and from diamond-drill cores. Two of the sample sets examined were collected from the Cave in Rock fluorspar mining area and the remainder from the Rosiclare area. Samples were taken at every change in lithology unless the lithology was consistent for more than 5 feet. In such cases one sample was taken for every 5 feet. The average sample interval is about 2 feet.

The procedure used was essentially that outlined by L. E. Workman of the Illinois State Geological Survey. A 12-gram sample was dissolved in dilute hydrochloric acid and the coarse and fine residues were separated by decanting. Both fractions were weighed and examined under the microscope. The calculated percentages of insoluble residues were plotted in graphic form (fig. 1) to facilitate the comparison of results from one set of samples with another. The residue graph represents the most complete section available at the present time and is typical of both formations. This graph is based on samples taken from diamond-drill cores of the Rosiclare Lead and Fluorspar Mining Co.—A. C. No. 2 test hole.

The Levias limestone is characterized by relatively little insoluble material, having a maximum of 13 per cent and a minimum of 3 per cent in the sections tested. The average residue content is about 8 per cent. The Levias is subdivided into two zones. The lower zone (A) is characterized by very fine sand grains, showing secondary crystal growth and comprising two to twelve per cent of the rock. These sand grains are probably reworked from the underlying Rosiclare sandstone. Glauconite which also may have been derived from the Rosiclare is present in this zone. The very fine silt and clay fraction is relatively unimportant in this zone and does not exceed 3 per cent of the rock. Zone A is variable in thickness, ranging up to a maximum of 4 feet in the sections studied. The residue graph (fig. 1) exhibits a well developed zone A of Levias.

Zone B of the Levias is characterized by a relatively low average residue content of about seven per cent in the sections studied. The residues are dominantly very fine silt and clay. The coarse fraction, rarely exceeding one per cent of the total rock, is characterized by very fine silt aggregates that are frequently tubular in shape, possibly indicating an organic source. The average thickness of zone B in the sections studied is about 16 feet.

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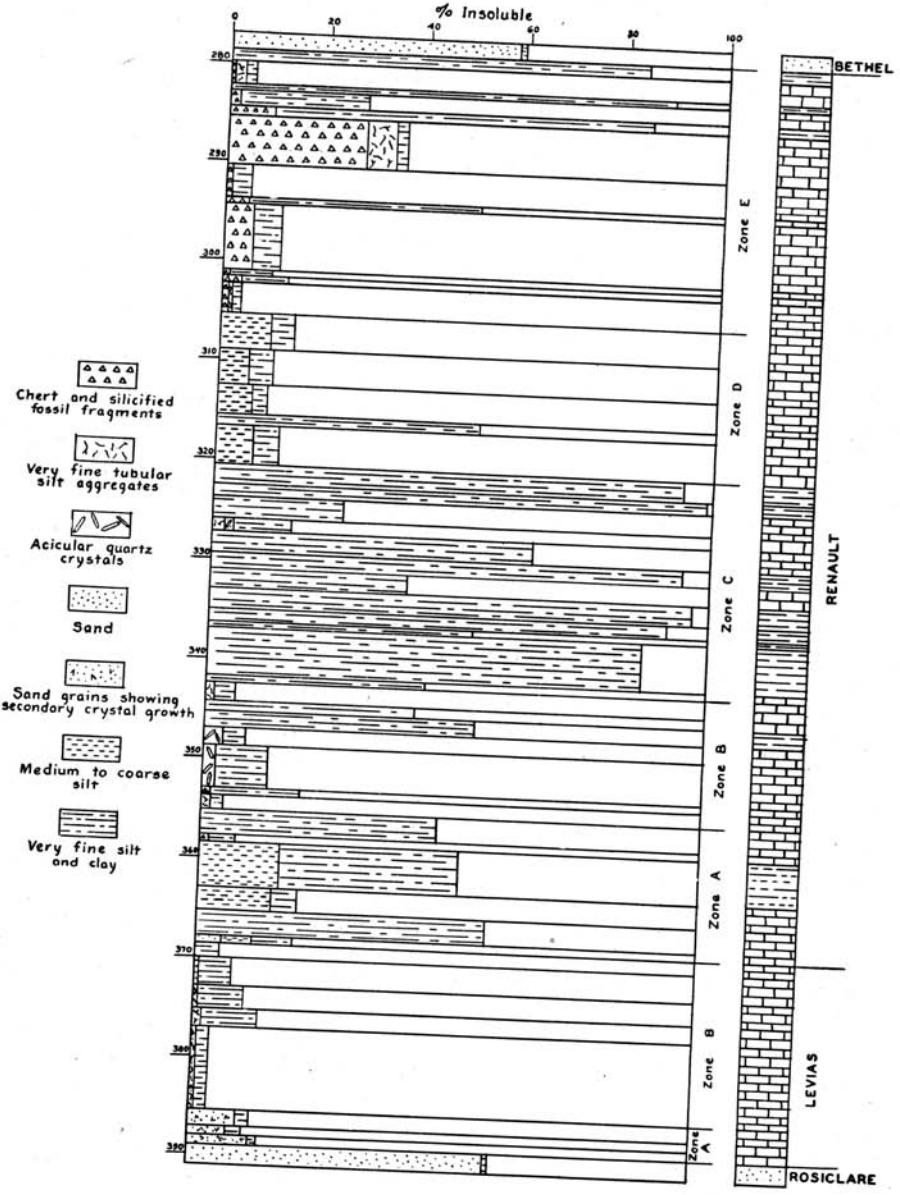

INSOLUBLE RESIDUE GRAPH

ROSICLARE LEAD AND FLUORSPAR MINING CO. – A. C. NO. 2
SEC. 32, T. 12 S., R. 8 E., HARDIN COUNTY

ILLINOIS STATE GEOLOGICAL SURVEY

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Fig. 1.

The contact of the Levias and Renault is characterized by an abrupt change in total residue content, the average content of the Renault being about 40 per cent as compared with the average of 8 per cent in the Levias.

The Renault is subdivided into five zones on the basis of insoluble residues. The total residue of zone A at the base covers a wide range from 10 per cent to as high as 58 per cent, the variation being due to the variable proportion of clay material. The coarse residue is characterized by the presence of medium to coarse silt grains, which comprise 5 to 15 per cent of the total rock. The abundance of silt is the distinguishing characteristic of this zone. The average thickness of the zone is about 14 feet.

Zone B of the Renault is characterized by low total residue content except for a few thin beds of shale. The average residue content is about 9 per cent, dominantly clay. The coarse fraction varies from less than 1 up to 4 per cent of the total rock and consists of fine acicular quartz crystals and very fine tubular silt aggregates similar to those in Zone B of the Levias. A 3-foot shale zone near the top seems to be traceable throughout the area. The average thickness of the zone is about 13 feet.

Zone C of the Renault is a very high residue zone consisting of very finely silty calcareous shales and thin beds of argillaceous limestones. The average residue content is about 75 to 80 per cent. A few of the less argillaceous limestones may have minor quantities of very fine silt aggregates typical of the zone below. The average thickness of this zone is about 20 feet.

Zone D has a relatively low residue content, characterized by an abundance of coarse silt and minor amounts of clay and very fine silt. The coarse silt content ranges from 6 to 10 per cent and the fine fraction from 2 to 5 per cent.

Zone E of the Renault is characterized by chert and silicified fossils, particularly crinoid stems. The total residue content varies from 5 to 27 per cent depending on the per cent of chert present. A few calcareous fossiliferous shale beds tend to increase the average residue content of the zone. The chert is white to faintly bluish. Very fine tubular silt aggregates may be present in considerable quantity, but are not persistent. Frequently silicified brachiopods have been noted. The maximum recorded thickness of this zone is about 35 feet.

In some localities the Bethel sandstone rests directly on zones C and D or on an unusually thin section of zone E. This is indicative of the unconformity recognized at the base of the Bethel sandstone.

Conclusions

It is shown herein that on the basis of insoluble residues the Renault can be readily subdivided into five persistent zones. These zones are applicable to the Illinois fluorspar mining area and may be used to establish stratigraphic position within the Levias and Renault limestones. The unconformity at the top of the Renault formation is very well established by the absence of zones D and E in some localities. The low residue content of the Levias offers sufficient data to separate that limestone from the overlying Renault limestone. The presence of sand grains showing secondary crystal growth in the lower Levias is an adequate criterion to separate the Levias and Rosiclare members of the Ste. Genevieve and to indicate that there was at least a limited amount of reworking of Rosiclare sandstone during the early deposition of the Levias limestone.

Acknowledgments

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