The Genesis of the Zinc-Lead Ore Deposits of Upper Silesia, Poland

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Abstract

In his considerations regarding the genesis of Upper Silesian zinc-lead ore deposits, the author refers to the known facts and the observed regularities in their form and occurrence, presented earlier in a paper published in the Economic Geology Monograph 3, 1967. In this paper, objective and subjective factors affecting the hypothesis of genesis of the deposits are discussed. The hypothesis of sedimentary origin is further substantiated, and the secondary processes which distorted or obliterated the primary structure of the deposits are taken into consideration. From the evidence accumulated to date it appears that at least two deposit-forming stages can be distinguished:

stage I – in which disseminated ores formed, synchronously with dolomites,
stage II – in which further concentration of primary ores and secondary alteration of the primary dolomites took place.

The present picture of the Upper Silesian Zn-Pb ore deposits is the result of several overlapping processes. The deposits can be regarded as polygenetic because both syngenetic and epigenetic processes played a significant role in their formation.

The present paper refers to the hypotheses on the genesis of Upper Silesian zinc-lead ore deposits published in Economic Geology Monograph 3, 1967 as a contribution to the discussion concerning stratiform deposits of lead-zinc, barite and fluorite ores.

The widening scope of research, the use of better methods and consequently, the growing body of knowledge about these deposits have made this evolution inevitable. On the other hand, the information regarding the geotectonic position of the deposits, their stratigraphy, lithology, form and structure, mineralogical and chemical composition, textural and structural habit, and the regularities of their regional distribution is still valid (Econ. Geol. Monograph 3, 1967).

Hypotheses on the genesis of deposits are advanced basing on the existing state of knowledge and specifically, on the data accumulated during the investigations and regarding the regularities in the form and distribution of the deposits. Our knowledge of the zinc-lead ore deposits of Upper Silesia has recently been greatly extended. A great number of data have been accumulated, both of a general nature and on the deposits themselves. Moreover, the scope of geological observation has been widened due to the discovery, surveying, and opening out of the deposits near Chrzanow, Olkusz and Zawiercie. Several new methods have been used to carry out investigations.

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As a consequence of this steady inflow of information, several new questions emerge, which complicate the solution of the problem, difficult as it is, of the genesis of the deposits. There are many factors, subjective and objective, which make this problem extremely difficult to solve. The objective factors are, for example, the polygenetic character of geological phenomena, the ambiguity of known facts, and the limited scope of geological observation. The investigator's subjectivity, the fragmentary and unrepresentative character of investigations, the research methods used, the simplification of problems, the overrating of some data and interpretation of disputable features, the reliance on presumed elements, the traditional approach, etc. are some of the subjective factors.

The polygenetic character of geological phenomena is responsible for the fact that the objects of investigations are geological formations which usually owe their origin to a number of successively overlapping processes. Secondary processes, sometimes of minor importance, frequently obscure the primary deposit-forming and alteration processes. The ambiguity of several facts allow various interpretations, which leads in consequence to different hypotheses concerning the genesis of a given deposit. While the objective factors are beyond the investigator's control and generally affect in the same degree the formulation of a hypothesis, the subjective factors depend to a greater extent on his subjective feelings.

Not unimportant for genetic considerations is the scope of investigations and their representativeness in relation to the deposit. This applies particularly to earlier studies, which were confined to certain elements of the deposits, for example, crusty and brecciated ores were investigated and other varieties neglected, or only ores and no barren host rocks were taken into account. Commonly geochemical studies were carried out on a fragmentary collection of samples.

The adopted methods of investigations are of prime importance for the study of deposits, the conditions of their occurrence and the governing regularities. It is imperative that these methods should have a complex character. Equal importance should be attached to more general regional and detailed local investigations, and to macro- and microscopic, chemical and microchemical features.

Over the past decades several hypotheses of sedimentary origin of Upper Silesian zinc-lead ore deposits have been advanced (Gruszczyn 1956, 1967; Smolarska et al. 1972; Smolarska 1974). In view of the growing body of knowledge about the deposits in question, some modifications and extensions to these hypotheses have been inevitable. The most complete theory has been put forward by Smolarska (Smolarska et al. 1972; Smolarska 1974).

The present picture of the zinc and lead ore deposits of Upper Silesia is distorted by secondary processes, which obscure or sometimes even obliterate their primary structure. These are paleokarstic phenomena and the attendant clay accumulations, the rise of brecciated deposits, the filling of fissures, local metasomatic phenomena, changes produced by present-day weathering and karstic processes, etc.

The hypothesis of the sedimentary origin of Upper Silesian zinc-lead deposits rests on the following facts and regularities:

The mineralization of the Triassic rocks has a regional character not only in a Polish but also in European scale.