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PHOSPHORITES OF ALBANIA

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ABSTRACT

Phosphatic mineralizations in Albania are formed during the following phosphorogenic epochs: Upper Cretaceous, Middle Jurassic and Silurian-Devonian. Phosphate ores of Upper Cretaceous and Middle Jurassic stratigraphical levels occur in Ionian zone.During Silurian - Devonian period some phosphatic anomalies are formed in Korabi zone. Uraniumbearing phosphatic mineralization of the Middle Jurassic is linked with a break in sedimentation. During Upper Cretaceous Phosphorogenic Epoch phosphate - carbonate - chert - globotruncanic horizon of Coniacian was formed.

The formation of this horizon has apparently taken place in an opensea basin.Separation of Phosphoros is supposed to have occured as a result of precipitation during sedimentation and in a diagenetic way, by phosphatization of microfauna and carbonates.

Key words: Albania,Phosphorites,Ionian zone,Korabi zone, Upper Cretaceous (Coniacian), Middle Jurassic, Silurian - Devonian, Uraniumbearing phosphorites.

I. INTRODUCTION

The first efforts of Albanian geologists were materialized with discovering of poor phosphate limestones at the Kurveleshi plateau in 1956. Since 1960 ,in an attempt to secure raw materials for phosphate fertilizers for country, geological research and mapping work has been intensified. Likewise, stratigraphical, paleontological, mineralogical, technological, etc, detailed studies have been carried out.

In the 70's researches for phosphorites were done in Greece in the Upper Cretaceous deposits of the Jonian zone by A.E.H.E.P.L. and I.G.M.E. (Skurnakis, 1979, Mechairos et al,1979) as well as radiometric studies of the Epirus and Jonian islands (Stauropodis & Basiakos, 1981).

This contribution presents general data on the phosphorites of Albania, especially, on the Upper Cretaceous phosphatic horizon, because in this horizon are prospected some deposits of industrial phosphate ores.

In preparation of this contribution, along side with his own factual material, the author also used previous publications by other researchers, chiefly Albanian and Greek ones.

II. PHOSPHOROGENIC EPOCHS IN ALBANIA

In Albania there are found and studied outcrops of mineralizations of the following phosphorogenic epochs (Fig. 1):

Silurian - Devonian
Middle Jurassic

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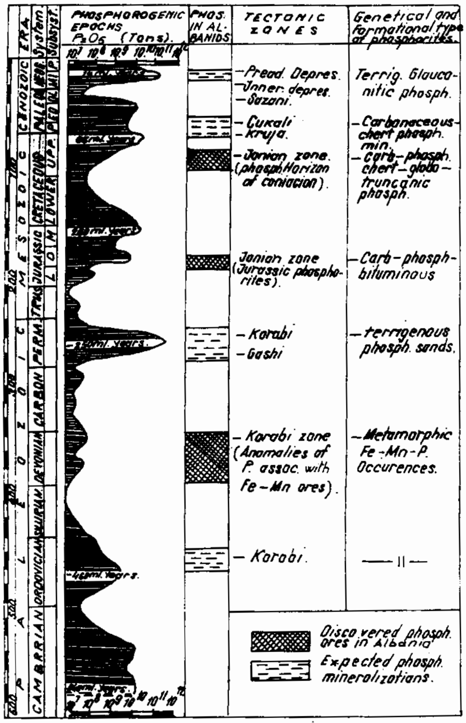

Fig. 1: Phosphorogenic epochs of the world and phosphor-bearing rocks in Albania.

Upper Cretaceous

Some outcrops of phosphatic mineralization of Silurian-Devonian age are found in area of Korabi zone at northeastern part of Albania. This mineralization is situated in chlorite rocks and sericite schists with black shales and it is accompagned by chlorite - schamozite iron mineralization (Hoxha V., Alliu I., 1979) and by mineralization of manganese (Qirici V., 1987). The content of P2O5 of mineralization is very low (2-5 %, rarely till 8 %). Uraniumbearing phosphatic mineralization of the Middle Jurassic is linked with break in sedimentation and is widespread in some anticlines of the Jonian zone.

During Upper Cretaceous Phosphorogenic Epoch in Albania was formed phosphatic horizon of Comiacian which will be descrised in details below.

Based on many anomalies of phosphorous as well as on stratigraphic, lithological - facial and paragenetic, paleogeographic, tectonic - structural premises and in geochemical coefficient of the formation of the phosphorite sedimentary deposits, have been reached to the conclusion that in parallel with the known phosphorogenic periods in Albanides have to search also for the echos of phosphorogenic epochs of Miocene - Pliocene, Permian, Ordovician and Paleocene-Eocene (Serjani, A., 1988).

III URANIUMBEARING JURASSIC PHOSPHORITES

Phosphate ores of the Middle Jurassic and Upper Cretaceous levels occur in Jonian zone in Albania and Greece.

In Fig.2 it is presented common lithological - stratigraphical column of the Jonian zone (A), lithological coloumn of the phosphate horizon of the Upper Cretaceous with graphic of P2O5 content (B), and Middle Jurassic mineralization (C).

Phosphatic mineralization of the Middle Jurassic is found only in sections with break in sedimentation. At the bottom of the break in sedimentation there are everywhere massive limestones of the Lower Liass (Pantocrator limestones). The gap in sedimentation is not always co - associated with phosphatic mineralization. Phosphatic mineralization occurs in two forms:

1. Bedded mineralization (stratiform phosphorites).
2. Mineralization of different morphological types (sedimentary veins, pockets, nets) filling fractures and cracks of massif limestones of Lower - Middle Liass.

Bedded mineralization occurs rarely and the phosphatic bed is usually very thin (0,2 - 1 - 2m). Phosphatic bed is situated some meters above the contact of the gap within bedded limestones of Doger and is intercalated with thin

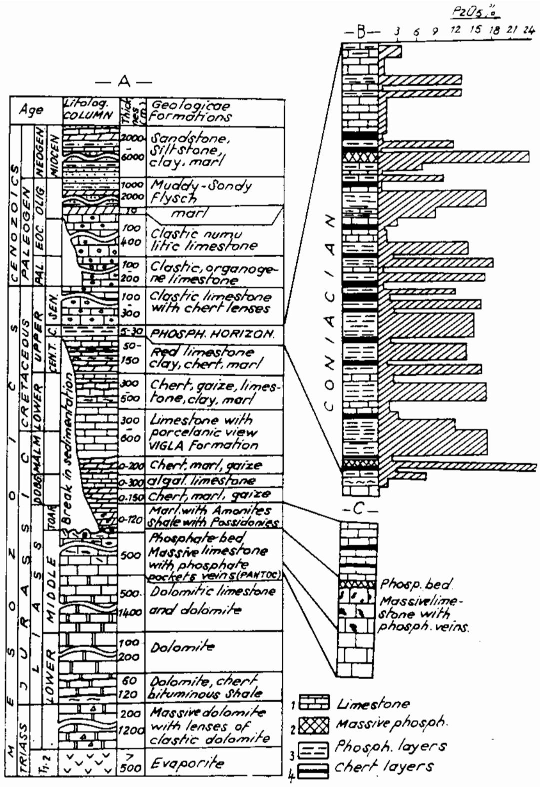

Fig. 2: Lithological - stratigraphycal coloumn of the Jonian zone (A), of the Phosphatic Horizon of the Upper Cretaceous (B) and Middle Jurassic mineralization (C).

chert layers. Many macrofauna type Possedonias in the phosphatic bed there are found. Phosphatic bed has content 20 - 25 % P2O5 and 0,01 - 0,005 % U (intensity of gamma - radiation varies from 80 to 200 Mkr/h).

Phosphatic mineralization of infiltration type is widespread and has higher content of P2O5 and U, but it is spread in masive limestones of Lower - Middle liass and it is difficult to do exploitation with economic profits. Thicknes of mineral zones with phosphatic veins, disseminations and nets is about 10 - 20 m, rarely 30m. The content of mineral zones varies from 2 - 3% P2O5 up to 24% P2O5 , whereas the intensity of gamma - radiation varies from 30 up to 300 Mkr/h. (Serjani A., Dafa F., 1993).

Phosphatic bed is formed during Middle Jurassic age in biogenno - sedimentary - diagenetic way. The mineralization of veins type is formed in the epigenetical way during infiltration of phosphate solutions into massive limestones of the Lower - Middle Liass.

The phosphorites were formed in the photic zone on submarine mountains whereas the black shales in basins a few hundred meters deep (E.Chiotis, and P.Vechios, 1992).

IV. PHOSPHATIC HORIZON OF THE UPPER CRETACEOUS

4.1. Geographycal and geological-structural spreading

Phosphorogenic Period of Upper Cretaceous is represented by the carbonate - phosphate - chert sequence,which is widespread throughout the Jonian zone in Albania and Greece.

In order to get a more accurate idea of the extent of the phosphatic facies in Albania and the neighbouring countries we have compiled the schematic map shown in Fig.3.(Serjan A. 1991).

The facies of sedimentary phosphatic rocks are widespread in the Jonian tectonic zone in Albania and Greece.In the islands of Cephalonikos and Zakintos, belonging to the tectonic zone of Paksos (Sazan - Karaburun), the encountered phosphatic facies (216 P; 217 P) are of a terrigenous nature (Anastasopoullos & Koukouzas 1977), while the phosphatic facies ot the Bulgarian - Jugoslavian boundary (28 Fe, P ; 165 P) belong to metamorphic ones with gneises, micas, schistes, etc.

In spite of the vast facial extension of the phosphatic horizon throughout the Jonian zone, better concentrations and the main ore deposits are located in the central subzone of the Jonian zone (anticline belt of Kurveleshi),

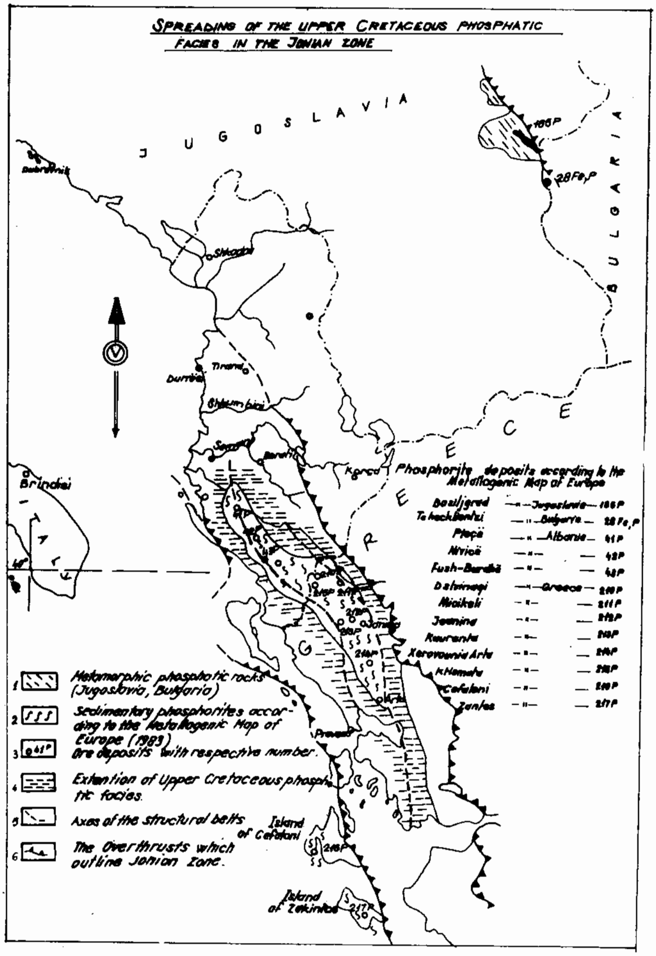

Fig. 3: Extention of Upper Cretaceous phosphatic facies in the Jonian zone.

while in the southern continution, in Greece, the main ore deposits are situated in the most eastern anticline belt (Micikeli), or in the most eastern part of the central subzone of the Jonian zone. Thus we think that here we have to do with two almost paralell perspective phosphorogenic axes (Fig. 3).

4.2. Stratigraphical position of the horizon

The Upper Turonian - Lower Senonian age of the phosphatic horizon has been determined in 1968 (Kondo A., 1968). The age given by Greek authors belongs to the Upper Cretaceous (Skurnakis, 1979) or the Middle - Upper Cretaceous (Mechairos & al. 1979).

Only two works are doubtful about the Coniacian - Santonian age (Aubouin & Ndojaj 1965; Patzelt, 1971).

Several detailed sections through various structures of the Jonian zone have been carried out for determining the exact age and stratigraphical position of this horizon. Almost in all sections, with some rare exceptions, immediately on the clay strata of the bottom of the horizon is observed a bloom of rich microfaunistic association with predominance of the planktic forms (globotruncanas mainly). The following globotruncanas have been found; Globotruncana Renci, G. Schneegansi, G. Coronata, G. Lapparenti, G. Sigali, G. Concavata, G. Fornicata, Heterohelixidae, Radiolaria, Ostracoda, Pithenella, Globigenerinidae, etc. Traces of Ammonites and Baculites of vertebralis have also been found in this horizon (Patzelt, 1971).

Based on the above mentioned faunistic assemblage, the Coniacian age of the horizon has been determined and the Globotrucana Concavata zone is named (Serjani & Ylli, 1984). The lower deposits of the bottom of the phosphatic horizon are of the Turonian and belongs to the Globotruncana Helvetica cenozone.

4.3. Lithological-facial features of the horizon

The horizon consists of limestone, phosphorite and chert layers. The thicknes of the horizon varies from some meters up to 40 - 50m. The thickness 8 - 10 - 15 m predominates in general.

The limestones strata thickness varies from 02 to 04 m rarely 08 - 1 m .The chert layers are 0,05 to 0,2 m thick. Depending on the relations of the above mentioned lithological components, the horizon forms different lithological - facial types in different structures, and changes also the average content of P2O5 and the meter percentage indicator. The horizon has an evident phosphatic character in the central parts of the Jonian zone, where the overwhelming majority of phosphorus has been deposited. At both flanks, in west and east, we have replacing of the phosphatic facies by the carbonaceous ones. To the west, close to the seaside mountainous chains occurs also the reduction of the phosphatic horizon, while the contrary occurs to the east. The thickness of phosphatic layers varies from 02 - 05 to 1 m and the content from 7 - 20 % P2O5 rarely more.

4.4. Petrography

The limestone strata of the phosphatic horizon consist of micritic, often marly sorts with laminated texture, fine plancton and phosphate grains. Biopelmicritic, biomicropeletal and marly limestones also with very fine plancton are encountered in the strata of the limestones on top of the horizon in several sections.

The strata and phosphatic bands consist of massive micritic, biomicritic with laminated structures and globotruncanic phosphorites. Many phosphatic pelets and fine abundant coprolites occur in the phosphatic strata.

Often iron - manganese detritus occurs in the phosphatic limestones of the floor and top of the horizon. Iron hydroxides formed by pyrite oxidization are also frequent. The phenomenon of phosphatization and, in most cases, silicification, calcitization and pyritization of microfaune occurs. Chert strata consist of radiolaritic microcrystaline sorts, often low phosphatic ones with laminated structure.

4.5 Mineralogy

The principal mineral of phosphate ores is Francolite(Koi M,1985). Based on the chemical composition, the author comes to the conclusion that Carbonate - Fluor - Apatite should be also presented along the Francolite (Serjani A, 1990). Calcite is coassociated principal mineral and it is often predominant in poor phosphatic and phosphatic limestone layers. The following secondary minerals can also be identified: Illite, Pyrite, Quartz, Limonite, Stroncianite, Barite, Anhydrite, Felspar, Dolomite, manganese minerals, and bituminous matter.

4.6. The sedimentation and the conditions of formation

The phosphatic megasequences are biomicritic formations sedimented into an opensea basin with low energy, under the basis of the wave action. Whereas the layers of the floor and top are biocalcarenitic, of the turbiditic nature, and formed, in a high energy environment (Serjani A., 1990).

The sedimentation of phosphatic layers is characterized by: the antagonism with the detrital and clastic matter, the lack of the argillic matter in rich - phosphatic layers, the pelagic sedimentation environment and co - association with bios.

The phenomen of hard grounds of unlitified strata, wich proves the activity of the underground currents often occurs, especially in Gusmari deposit of massive phosphate ores .

The presence of phosphatic strata as well as pyrite disseminations, organic matter and traces of elements such as Pb, Zn, etc testify of the formation in a pelagic reduced environment, at levels of depth with minimum oxygene (Slansky, 1980).

The chemical, mineralogical, petrographycal and paleontological investigations of the horizon such as the recent works on the formation of phosphorites into the floor of the ocean (Baturin, G. N., 1982) allow to suppose that with respect to the formation of the microgranular francolite in a biochemical way at a greater depth than the shelf ones, diagenetic procesess of phosphotization of microfauna and carbonate have played an important role. The deep palaeofaults contributed especially to the formation of the favourable sea floor bathymetry, mainly for the central subzone of the Jonian zone. Thus we consider the formation of phosphatic strate as a sedimentary biogene diagenetic process.

V. RESOURCES

In the phosphatic horizon of the Upper Cretaceous geological exploration works are carried out and some poor phosphatic resources of 10 % P2O5 (21.8 BPL) are found in the anticline belt of Kurveleshi. Discovered resources are clasified under A+B+C categories and reach over 60,000,000 tons. They are situated just in Fushe - Bardha, Galishti, Ploca, Nivica and Gusmari deposits. In Gusmari deposit there are prospected a small quantity of phosphate resources of 28 - 33 % P2O5 (61.2-72.1 BPL).

Now the geological works are carried out only for prospect-discovery of layers with content over 15% P2O5 (37.2 BPL), which may be enriched in economic profits, while the technological studies aiming at the enrichement of the resources with 10 %, are the nessesery basis for the solution of our country needs and are of prespective, too.

VI. PRODUCTION

From 1980 there are exploited every year 30.000 tons phosphorite ores of 28 - 33 % P O from Gusmari deposit which are used in the production of simple superphosphate (SSP) in Lai Plant, meanwhile 30,000 tons of phosphatic ores of 10 - 12 % P2O5 are used every year in the production of phosphatic flour . This is used in acid fields (grounds) with PH 7.0.

Lai Plant processes about 150000 tons of phosphorate ores of 27 - 28 % P2O5, the most part of it is imported from North Africa.

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