THE MOUNTAINS PĂDUREA CRAIULUI BEFORE AND AFTER THE CLOSING OF THE FORMER BAUXITE QUARRY

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1. The geographical position

The mountains Pădurea Craiului represent the compartment between the Repede River and the Black River of the Apuseni mountains, being separated by Vladeasa and Bihor by the valleys Iada and Meziad, in the North reaching to the Depression Oradea – Bratca, in the south at the Depression Beius, and in the West at the Hills of Tasad.

The ”Peninsula” Padurea Craciului, by the thick packages of karstificable rocks, in alternance with other non karstificable, is an important field of the *karstic relief.*

The underground hydrographic network is obviously disorganized, in its path to depressions going deeper especially and forming new sectors of keys, and the underground one has a pretty significant development.

The method of expression *climatic* is resulted from the geographical position and orography, so that the annual averages of temperature are of 6 - 8° C in the high central part of the mountain area, and then it climbs to 8 - 9° C to the periphery, while the precipitations increase from 700 mm/year in the West up to over 1000 mm/year in the East.

The lithological specificity and the method of manifestation of the climate have determined the presence of the *bauxite* deposit. For the bauxite deposits, a special importance is that of the massive organogen chalkstones deposited in Tithonic, with which is ending the Jurassic sedimentation. It followed then, to the end of the Upper Jurassic and the beginning of the Inferior Cretaceous an important phase of uplift, when were created favorable conditions for the sub aerial modeling of the area coming from under the Jurassic sea, taking place, in the same time, an intense activity of formation of the Karstic relief (Pop, 1990).

The resources of bauxite are present especially in the area of highland of the Mountains Pădurea Craiului, in many plains: *Cornet - Valea Poieni, Gugu – Batrânu, Brejeşti – Vida, Râcaş - Ponicioara, Damiş - Bratca, Remeţi, Roşia - Farcu* and *Meziad* the basis of this richness, exploited in a certain degree even since the beginning of the 20th century, in 1965 was placed in function the production of *alumina* from Oradea, the bauxite being prepared (washed) in the stations from *Dobreşti* and *Chistag.*

In the Eastern part of the Padurea Craiului are present deposits of *refractory argil,* in the area of the localities *Şuncuiuş* and *Bălnaca,* used (at Aştileu, Alba Iulia and in other places from the country) for the production of the refractory bricks.

The mountain area of Padurea Craiului is crossed transversally (North-South) by the roads Aleşd - Aştileu - Zece Hotare - Roşia – Beiuş andTileagd - Vârciorog - Dobreşti - Sâmbăta, and from Bratca it climbs the road to Damis, this reaching in the first road mentioned.

The underground drainage of the waters is characteristic to the area by the existence of the systems of active caves, of which the most important is the Karstic system Runcşor – Sohodol – Albioara, situated in the South to the basin of the Black River, draining a surface of over 100 km^2, being one of the greatest and complex from Apuseni.

The main crest of the mountains Pădurea Craiului has the general direction NW – SE and is marked by the heights whose altitudes increase gradually to the South-East, reaching to be over 1000 m in Hodrânguşa (1027 m) and Măgura Beiuşele (1004 m).

2. The geological particularities

The mountains Apuseni is a part of the preapulian craton and of Transylvanian Tethys. From the structural point of view the mountains Apuseni have in constituency: Apusenides, Transilvanides and Bihor unit. The bauxites are related to the evolution of the Apusenides and are situated in the mountains Apuseni in the following areas: The mountains Pădurea Craiului; The mountains Bihorului

Apusenides

Apusenides come from the shearing of the base of the preapulian craton, during the pre-Gossau tectogenesis. They are antitectic mass of blankets and of base divided in two systems: the system of the masses of Codru, in inferior position and the system of the masses of Biharia in upper position. The fundament of both masses is the Unity of Bihor.

Unity of Bihor

Unity of Bihor from the Mountains Pădurea Craiului, presents over a crystalline basis belonging to the Gilau group, a succession of permo-Mezozoic sediments in perilitoral facieses, with frequent discontinuities more or less important.

The system of the Codru masses

In the South and South-West of the Padurea Craiului were identified three overthrust masses, belonging to the system of Codru:

Formations post-mass

After the Mezocretaceous and subhercinic movements (Mediterranean), the paleo geographic frame of Northern Apuseni was radically changed. The placing instead of the system of the Masses of Codru

and then of Biharia lead to the fragmentation of the sedimentation basins, so that the formations deposited afterwards (senonian) don't have unitary nature anymore, being hardly correlating from an area to another.

2.1. Bauxite formations

As it is seen from the field researches performed until the present were identified bauxite frames belonging, on criteria of stratigraphic superposition to a single industrial level, namely the inferior cretaceous.

Subiacent formations

For the description of the Mezozoic formations from Pădurea Craiului were used until the present some denominations that correspond, at least partially, to the International Code of Stratigraphic Nomenclature (Hedberg code), but also many denominations that don't correspond to it.

Formation of Vad

Definition: Dark Grey lime stones with frequent nodules of silex black decametric (at the inferior part, characterized by the presence of some microfacies uniform pelmicrosparitic or pelsparitic, generally very poor in the macro fauna.

Formation of (diachronic) of Farcu-Cornet

Formation of Albioara

Definition: Dark Grey lime stones (rarely with light color intercalations), with decametric stratifications (rarely having banks of meters), generally microspartic, but also micritic to the base with great oncolitic structures, centrimetric, lighter in color.

The relation of the bauxite with the substrate. The karstification of the substrate.

The limits of deposits – the inferior and marginal – are very irregular moulding the developed paleoelief on biogen lime stones of the reefs of the Malm, also they are net.

The facies developed in the rocks from the bauxite bed

The facies developed in the rocks from the direct bed of the bauxites are from the reef field with identification of many areas from the reef area.

Litology in the bauxite complex. Litologic model

Superior Jurassic deposit

At the limit of Tithonic-Kimmerdgian are separated two occurences of bauxite. The occurrence from the key of Albioara is formed from a stratiform body of white iodic bauxite.

Primary cretaceous deposit

Bauxite plays the role of the filling of the paleocarst. Petrographically this deposit is the most often without detritic deposits.

The phenomena of subsequent karstification, actual and alteration have produced

The cretaceous deposit of 2nd generation

The stratified bauxite, in part pelitomorph, in part detritic, boehmitic and hematitic, forming the filling of some cavities of Aston type, more profound than those of the industrial horizon, represented by Lentile 204 with dinosaurs.

The cretaceous deposit of 3rd generation

The bauxite is pelitomorph, in some places with disseminated oxides, more or less deferrized and caolinous forming the filling of a fissure karst developed on the margin of the massive bauxite body, but also in depth, up to the intersection of the body of massive calcite from the 2nd generation of karst.

Bauxite of 4th generation

A massive ooidic bauxite, red, boehmitic, goethitic and caolinous, forming the filling of some very deep crevice open in the Barremiene lime stones from Valea Vida.

The secondary quaternary deposit

The primary bodies are deteriorated, the processes of disaggregation favoring the appearance of the disaggregation bauxitiferous material in different stages of alteration and dimensions accumulated at variable distances by the primary bodies, in the negative relief developed beginning from Quaternary.

The litologic model. Bauxite with different degrees of fragmentation, from summilimetric fragments up to blocks, enclosed, together with fragments of different rocks: lime stones sub and supraiacent, in a red argil mass. The red color is a complex result of the residues coming from dissolutions quaternary actual of the lime stones, oxyhydroxides of ferrum comings from the alteration of the bauxites, or remobilized from the soil.

Supraiacent formations

Formation of Blid

Definition: transgressed succession of grey lime stones, stratified, micric, sometimes fenestral, with ostracod, miliolid and orbitolinid. We include here also the discontinuous accumulations of bauxite from the base.

Formation of Ecleja

Definition: monotonous succession of grey marls, in part siltic, up to marl siltites, that in sectors carry basal, massive limestone breccias (with fragments of cretaceous, Jurassic, bauxite lime stones), of marl-lime stones with skid of yellow alteration and black or violeaceous lime stones with orbitolinid, in banks of 0,5-2 meters, reaching to 60-70 meters.

Formation of Valea Măgurii

Definition: succession of grey or light grey lime stones stratified in metric banks, generally fine micritic, but also pelmicrosparitic, with orbilolinid and rudists, that stay over the marls of the Formation of Ecleja.

Formation of Vârciorog

Definition: succession of grey o black marls, marl sandstones, glauconitic sandstones and dark grey lime stones up to black with orbitolinid and rudists, that cover discrepant a paleorelief weakly broken, developed on the limestones of the previous formation (in which sometimes are met accumulations of ferruginous – bauxitic deposits) everything reaching to 400-500 m depth.

Detritic red formation informal denomination

The superior part of the sedimentary deposits under the overthrust masses is ended with red-cherry or green detritic deposits of cenomanian-turonian middle age.

The relation of the bauxites with the direct roof

The relation is very simple, direct, without slow transitions, locally there are small intercalations between the two terms, but generally is made by a surface relatively plane, on which are insinuated recent argil terms.

The succession of facies from the supraiacent deposits

As it was showed previously the type succession, recognized and generally valid, is that of the formations above described. As it was expected, intervenes often a local, fascies component, that comes to modify sometimes, up to special complications, from the litologic point of view, the general aspect.

Local facies

The adding of facies, local, would be the following:

The paludal continental facies

Paludal facies

In some areas are described immediately over the cover of bauxite, deposits belonging to an area connected to the oscillation of the marine level, constituted of brescias with fragments of bauxite, with micrito-argilous matrix, micrit with fenestral lamination, pedologic ooides.

Lacustrine-fluviatile facies

Characteristic to the development in lacustrine basins with waters of small depth, generally temporary. As it is known the hydrographic network is disorganized in karts, which leads to the sporadic feeding of the lakes.

The transitional lacustrine-salmastre-marine facies

Is the facies that starts with the lime stones with Chara, micritic sediments with Chara and Ostracode belong to the lacustre area, of deep waters from the permanent lakes.

The general facies chart

The first deposits that cover the bauxites are, generally, of sweet facies, but we showed that there are also normal marine intercalations, or intercalations with marine fauna contents, that proves a marine influence on many levels of the lime stones with Chara.

Associated deposits

Deposits associated to primary cretaceous bauxites

In case of lentils close to the surface, the superior part of the deposit is altered and, depending on the textural and structural type, presents fissures in blocks up to an aspect of non cohesive mass, strongly fragmented. The fissures have different fillings frequently of argil, but also calcitic.

Deposits associated to cretaceous bauxites of 2nd, 3rd generation

Also with the boehmitic bauxites of 2nd generation, and with the pelitomorph ones of the 3rd generation, are intimately found associated carbonic lacustrine rocks, well distinct in relation with the lime stone with Chara from the immediate roof.

2.2. Bauxite texture

Under the textural aspect, the bauxites are made of fundamental mass, in which float intraclastic and ooidal corpuscles, to which are added the fissures and their filling. In some samples are remarked also other textural elements: autigen minerals, recrystallized minerals, points or areas geochemically differentiated by the depletion of some elements (deferizations), clastic elements.

Some forms seem to be fragmented by bauxite more deferized enclosed in mezostasis, incomplete ooids, modified by diagenetic solvation, resorption in the mass of mezostasis (Papiu and collab., 1970).

2.3. Stratification and homogenity

The bauxitic rocks from Padurea Craiului were separated as being: generally massive rocks, compact, with the exception of bauxites strongly deferized, that are porous, and have earthly consistency.

2.4. Physical properties

Bauxites are rocks fine granular, massive, compact and very rough. The characteristic colors are: red, cherry, red-pink, yellow, green. The bauxites are rocks with high hardness, from rough to very rough, but there are no systematic studies for their determination.

Fig. 1 Reclamation view of the former bauxite quarry from Zece Hotare, Bihor)

Fig. 2. Mattresses after the final step 2004) from the former bauxite quarry from Zece Hotare, Bihor

Fig. 3. Hill side after 5 years old mattresses from the former bauxite quarry from Zece Hotare, Bihor)

In 1998, the bauxite quarries were closed and in 2004 and 2005 were performed ample works of leveling and planting of acacia in the leveled area and spruce on the versants. In the figures 1 and 2 are presented aspects from the leveling and drawings of beechwood from the neighbor forest, and in figure 3 is presented an image of the versant with drawings at 5 years from placing.

In 2005 the author of the present paper has placed a research field in the former quarry from Zece Hotare. This research field includes the following experiments:

1. The study of the influence of chemical fertilizers on the biometry of the planted material and on the soil.
2. The study regarding the influence of the decline on the erosion of the field from the versant and on the installation of the spontaneous herbal vegetation. The researches from the field from the former quarry from Zece Hotare stayed at the basis of the elaboration of the PhD thesis ”*Monitoring and ecologic reconstruction of the fields from the bauxite quarries”* and of the following books: Brejea R., Domuţa C., 2009, *Remaking and protecting the fields from the bauxite quarries from the mountains Pădurea Craiului*, Editura Universităţii din Oradea; Domuţa C., Brejea R., 2010, *Erosions of the fields in decline from the North – Western Romania,* Editura Universităţii din Oradea; Domuţa Cornel, Radu Brejea and collab., 2011, *Erosion of the fields in decline from Bihor*, Editura Universităţii din Oradea; Brejea Radu, 2012, *Landshaft of the former quarries of bauxite from the mountains Pădurea Craiului*, Editura Universităţii din Oradea, being based on results obtained here the author has published 8 papers ISI, 50 papers BDI. Also on the basis of the researches accomplished at Zece Hotare it was made a contribution to the gaining of some research projects from the national programs and CNCSIS.

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