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Classification of recrystallized, dolomitized and bituminous carbonate rocks

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The proposed classifications of recrystallized, dolomitized and bituminous carbonate rocks are based on the Folk's classifications of limestones. The most complex among them is bituminous carbonate rock classification as it may include carbonate rock, bitumen, and pore classifications.

INTRODUCTION

Synthetizing the relevant data we shall get — depending on the possibilities and actual needs — simpler or more complex classifications. With the development of a given scientific field the classifications will gain in complexity as a result of a constant increase in numbers and versatility of analytical data. This will lead us to the conclusion that there are no universally applicable classifications which could cover all aspects of the studied matter.

Therefore, following the developments and achievements in particular scientific fields, we may see that every period has had a classification (or classifications, or modifications of these classifications) favoured at that particular time.

Numerous are carbonate rock (limestone and dolomite) classifications published so far; we may mention those by Cayeux (1935), Višnjakov (1951), Rutte (1954), Ruhin (1956), Fairbridge (1957), Švecov (1958), Frolova (1959), Folk (1959, 1962), Carozzi (1960), Dunham (1962), Leighton & Pendexter (1962), Bissell & Chilingar (1967), Teodorovič (1968) and others. These classifications were developed on the basis of the authors' researches made in particular regions and were being aplied — or are still in application — at investigation of carbonate rocks as well as in other areas. Of the mentioned classifications the ones by Dunham (also Dunham's modified classification, 1964), Folk, Leighton & Pendexter (in Western countries) and Teodorovič (in Eastern countries) are now most frequently used. In the study of marine carbonate sediments the Dunham's (field) classification and Folk's (labora-

ducing also certain innovations, such as: the recrystallized limestone classifications one may get a fairly detailed picture of the lithologic composition of the studied area.

Studying lithotextures of carbonate rocks of the Dinarides according to the Folk's classification (1959, 1962, 1965) the present author has gradually arrived at some new conclusions. Completing or extending the nomenclature and symbols used in the mentioned Folk's classifications the author has tried to make some practical improvements, introducing also certain innovations, such as the recrystallized limestone classification according to the percentage and type of recrystallized calcite; classification of metasomatic dolomites according to the percentage and type of allochems and their crystallinity degree; and classification of bituminous carbonate rocks. The latter classification is of an integrated type, comprising in itself the carbonate rock classification and bitumen classification, allowing also for the inclusion of pore classification.

ON RECRYSTALLIZATION

Under recrystallization Folk (1959) understands such processes in which crystals of a given size and morphology are transformed into crystals of a different size and morphology, but retaining their original mineral nature. Folk deems the sparse packing of allochems in sparry calcite »cement«, the gradational recrystallization of matrix and the transecting of allochems to be reliable witnesses of recrystallization. According to Folk the recrystallized sparite — as well as the metasomatic dolomite — is normally represented by crystals having uniformly sized grains. As to the cement sparite, its crystal grains are of different sizes but it is also purer.

In his study on neomorphism, Folk (1965) separated items as (1) the aggrading neomorphism (symbol N — or better still N_a) and (2) the degrading neomorphism (symbol N_d). The aggrading neomorphism, in turn, is divided to porphyroid neomorphism (symbol N_p, probably) and coalescive neomorphism (symbol N_c). As to the shape of crystals Folk differentiates: equant, symbol E, bladed, symbol B, and fibrous, symbol F, while as far as their size is concerned they are divided to seven groups, i. e.:

— aphanocrystalline (0,001—0,004 mm, symbol 1)
— very finely crystalline (0,004—0,016 mm, symbol 2)
— finely crystalline (0,016—0,062 mm, symbol 3)
— medium crystalline (0,062—0,25 mm, symbol 4)
— coarsely crystalline (0,25—1,0 mm, symbol 5)
— very coarsely crystalline (1,0—4,0 mm, symbol 6)
— extremely crystalline (exceeding 4,0 mm, symbol 7).

When the main conceptions about recrystallization are applied to the carbonate rock deposits in Yugoslavia it comes out that Folk's contribution to the knowledge about the recrystallization and other neomorphic processes was great. It is doubtless that the present proposal

about the classification of recrystallized limestones and metasomatic dolomites has been written by Sebečić (1973) with Folk's classification kept in view. In the first place, this refers to the usage of codes for primary lithotextural types of rocks that represented to the author the main points of classification, and then to the term »pseudospar« and the prefix »pseudo« which has been used to denote different textural types of rocks. In the course of time I found the terms »pseudospar« and »pseudoallochem« fairly applicable in denoting or designating that what was not originally »spar« and not »allochem«. Therefore, from the frequent use of the above terms the idea was born to combine for the recrystallized calcite (carbonate) the respective name with the prefix »pseudo«, regardless to their shape, size and origin, as for instance: pseudosparry calcite, pseudomicrosparry calcite etc. The difference that exists between Folk's classification of recrystallized calcite and this one given in this article, is on the one hand of terminological character and on the other hand it is the size of crystals of recrystallized calcite (Table 1).

Table I. Terminologic differences in classification of recrystallized calcite as used by Folk (1959, 1965) and the present author.

Tabela I. Terminološke razlike za rekristalizirani kalcit između Folkovih klasifikacija i predložene klasifikacije.

	PSEUDOSPAR > 31 μ	porphyroid (Np) porfiroidan coalescive (Nc) spojasti	NEOMORPHIC CALCITE NEOMORFNI KALCIT	aggrading (Na) n. N(a) sa smanjenim zrnom	equant (E) izometričan bladed (B) listićav fibrous (F) vlaknat – random (R) nejednoliko orijentiran – spherulitic (S) sferulitni et al.	PSEUDOSPAR (PS) > 20 μ
MICROSPAR MIKROSPAR 4–15 μ	4–31 μ					PSEUDOMICROSPAR (PMS) PSEUDOMIKROSPAR 5–20 μ
MICRITE MIKRIT < 4 μ				degrading (Nd) sa smanjenim zrnom	equant (E) izometričan bladed (B) listićav fibrous (F) vlaknat (usually in a skeletion) najčešće u skeletu	PSEUDOMICRITE (PM) PSEUDOMIKRIT < 5 μ
Folk, 1959	Folk, 1965					Šebečić, 1973

The term microspar as used in the classification made by Folk is replaced here by pseudomicrospar, and the term microspar represents the cement microsparry calcite. The only reason for using the prefix »pseudo« is to point out the difference in the genesis of the determined sparry calcite. There is another prefix which could be added to the determined sparry calcite that developed through the recrystallization, i. e. the prefix »para«, so there would result paraspar or paramicrospar. In that case the primary sparry calcite might be added the prefix »ortho« and become orthospar or orthomicrospar. However, I preferred the prefix pseudo which can be of a broader meaning, and besides I wanted to escape the introduction of new terms and thus remain as close to the classification of Folk as possible. In this way the correlation between

the primary limestones and those recrystallized ones, as contained in the existing and proposed classification, would be much easier. The approximate size exceeding 20μ has been taken as the lower limit value for pseudospar, and for pseudomicrospar the approximate size of 5—20 μ. The approximate value of 20 μ instead of 15 or 31 μ was used to more easily interpret the lithotextures from the Folk's classification according to the classification of Dunham (1962) which had been elaborated by Dutch/Shell (1964) and which the experience has proved very suitable in field exploration conditions.

DEGREES OF RECRYSTALLIZATION, DOLOMITIZATION AND OTHER SECONDARY PROCESSES

That the degree of recrystallization in limestones and other carbonate rocks varies from case to case is a well known fact. Certain lithotextural types of rocks display their primary textures. On the other hand, there are lithotextural types which have greatly undergone recrystallization, and therefore, their primary texture is very difficult — if not even impossible — to be determined. The existing large scale of recrystallization degrees had induced the author of this study to classify recrystallized limestones according to the percentage of recrystallized calcite, as for instance the intensity of other secondary processes is determined in the same way, i. e. dolomitization according to the content in metasomatic dolomite, silicification according to the content in SiO_2 etc.

Limestone — biomicrite with 20% $CaCO_3MgCO_3$ is classified by Folk as dolomitized limestone-biomicrite, while a biogenic carbonate rock with 95% $CaCO_3$ $MgCO_3$ he classifies as biogenic dolomite. If for instance the term dolomitized or recrystallized biomicrite is used , it is evident that this biomicrite has undergone dolomitization or recrystallization, but the degree or intensity of these processes remains unknown if not separately indicated. Highly dolomitized biomicrite with more than 90% metasomatic dolomite — as I was told — is denoted by Folk as biogenic dolomite, and those highly recrystallized biomicrites with more than 90% recrystallized calcite as biomicrosparite. Since it has been stressed by Folk that the percentage of metasomatic dolomite contained in dolomitized biomicrite is above 10% and below 90%, those biomicrites with a content of 10—90% recrystallized calcite — if desired to be classified according to Folk — could be designated recrystalized biomicrites. As to the degree of limestone recrystallization the author has chosen the approximate limits of 10% and 50% of pseudosparry or pseudomicrosparry calcite.

Limestones with a content of pseudosparry or pseudomicrosparry calcite lower than 10% have been classified as slightly recrystallized limestones, as for instance slightly recrystallized pseudosparry intramicrite bearing the smbol SR PS 2I:LA, slightly recrystallized pseudomicrosparry micrite, symbol SR PMS 3M:L etc.

Limestones with 10—50% pseudosparry or pseudomicrosparry calcite have been classified as partially recrystallized limestones, as for instance:

partially recrystallized pseudosparry intramicrite bearing the symbol PR PS 2I:LA, partially recrystallized pseudomicrosparry micrite, PR PMS 3M:L etc.

Limestones containing more than 50% pseudosparry or pseudomicrosparry calcite have been classified as highly recrystallized limestones, i. e. pseudosparry or pseudomicrosparry varieties of limestone. In designating the highly recrystallized textural types of limestone, the denominations by Folk introduced into his classification have either been added prefixes »pseudo« or »pseudomicro« after the allochem for the given lithotextural type of allochemical limestone with sparry calcite cement, or they were changed. As far as the micrite microcrystalline limestones are concerned the term micrite has been replaced by the terms pseudosparite and pseudomicrosparite. The highly recrystallized limestones have been denoted by adding the symbol PS or PMS preceding the symbol designating a given textural type of rock, i. e. intrapseudosparite, symbol PS 1I:LA, pseudomicrosparite bearing the symbol PMS 3M:L etc. The impression one gets seeing the terms used in classifying the highly recrystallized microcrystalline limestones: pseudomicrosparite, symbol PMS 3M:L etc. is that the terms pseudosparite and pseudomicrosparite were used to compare the two genetic types of sparite varieties that were the subject of determination, as was the case with allochemical limestone. However, it is not the question about any comparison between the two types of determined sparite varieties, but about the designation of one type only, i. e. that recrystallized one, because the cement type being limited by a minimum allochems content (about 20%) does not exist. Because of this reason, the designation of the above — mentioned recrystallized types of limestone cannot be paralleled with the designation of limestone type where recrystallization had resulted in degradation of the grain size, i. e. of microcrystalline sparite varieties that had undergone degrading recrystallization, because — let us repeat — these types have not been encountered nor determined in marine limestones, so far.

The retrograde (degrading) recrystallization very rarely occurs in carbonate rocks. Suggestion is made to designate the microcrystalline calcite which developed as a result of retrograde recrystallization, as pseudomicrocrystalline calcite. Limestones with less than 10% pseudomicrocrystalline calcite could be classified as slightly retrogradely recrystallized limestones, as for instance slightly retrogradely recrystallized biomicrite, symbol SRR (S) 2B:LA. Limestone with 10—50% pseudomicrocrystalline calcite could be classified as partially retrogradely recrystallized limestone, as for instance partially retrogradely recrystallized biosparite bearing the symbol PRR (S) 1B:LA. The highly retrogradely recrystallized limestones with more than 50% of pseudomicrocrystalline calcite are added the prefix »pseudo« preceding the term denoting the secondary lithotextural type, as for instance biopseudomicrite bearing the symbol P (S) 2B:LA. The bracketed letter »S« may be added to denote that the sparry cement has undergone retrograde recrystallization. The microsparry cement would bear the symbol MS.

The division of limestones to slightly, partially and highly recrystallized limestones can be applied to the additional Folk's classification of allochemical limestones, dating from 1962 (see Table 2).

Those slightly recrystallized pseudosparry sparse biomicrites bearing the symbol SR PS 2SB:LA can be distinguished from the slightly recrystallized pseudosparry packed biomicrites bearing the symbol SR PS 2PB:LA, then, for instance, those partially recrystallized pseudomicrosparry sparse intramicrites, symbol PR PMS 2SI:LA can be distinguished from the partially recrystallized pseudomicrosparry packed intramicrites bearing the symbol PR PMS 2PI:LA; further on, the sparse oopseudosparite bearing the symbol S PS 1O:LA from the packed oopseudosparite with the symbol P PS 1O:LA etc. The same could be done with the retrogradely recrystallized allochemical limestone, as for instance slightly retrogradely recrystallized sorted biosparite, symbol SRR (S) 1SB:LA, then partially retrogradely recrystallized rounded biosparite, symbol PRR (S) 1 RB:LA, unsorted biopseudomicrite, symbol US P(S) 2B:LA etc.

When going into details in the classification of recrystallized limestones, the degree of recrystallization and the main group of sizes of recrystallized calcite crystals — pseudosparry or pseudomicrosparry — can be added to certain characteristics of recrystallized calcite as suggested by Folk (1965). For instance, partially recrystallized pseudosparry (porphyroid, bladed, 30 μ crystal size) biomicrite bearing the symbol PR PS (PPH, BLD, 3) 2B:LA, then (coalescive, equant, crystals 10 μ in size) pseudomicrosparite, symbol PMS (CO, EQ, 2) 3M:L etc.

The following context contains some of the author's observations concerning carbonate lithotextures, as well as the secondary processes, and which observations may be applied and introduced into the classification. A known fact is that certain limestones contain objects mimicking allochems, such as intraclasts, oolites or pellets, but which took their origin as a result of the process of recrystallization. Namely, the once homogeneous micrite sediment had in time undergone slighter or stronger recrystallization to pseudospar or pseudomicrospar, and the relics that remained unaltered may — but need not necessarily — resemble pseudoallochems. It is suggested that the limestones with pseudoallochems be divided into two classes according to the degree of recrystallization, i. e. to pseudo(-micro-) sparry and micritic varieties. The micritic varieties, in turn, may be divided into two subclasses: a) partially recrystallized varieties with 10—50% pseudosparry or pseudomicrosparry calcite, and b) slightly recrystallized with less than 10% pseudosparry or pseudomicrosparry calcite. The pseudo(-micro-)sparry varieties have more than 50% pseudosparry or pseudomicrosparry calcite.

Here are a couple of examples how to classity pseudoallochemical limestones: slightly recrystallized (pseudosparry) pseudointramicrite, bearing the symbol SR (PS) P 2I:PLA, partially recrystallized (pseudosparry) pseudointramicrite, symbol PR (PS) 2I:PLA, pseudointrapseudosparite symbol P PS 1I:PLA, slightly recrystallized (pseudosparry) pseudointraclastic fossiliferous micrite, symbol SR PI, 3B:PLA, LA (these limestone types contain less than 10% of pseudoallochems), partially recrystallized

(pseudosparry) pseudointraclastic biomicrite, symbol PR PS PI, 2B:PLA, LA, biopseudopelpseudomicrosparite, symbol P PMS 1 BP:PLA, LA, etc.

In the case of a complete recrystallization (or dolomitization, or silicification, etc.) of microcrystalline matrix and allochems of the primary limestone deposits, when the primary type of allochems cannot be either determined or supposed, such allochems can be designated x, and such type of e. g. thoroughly recrystallized limestone: xpseudosparite, bearing symbol XPS; or xpseudomicrosparite with the symbol XPMS or dolomite: finely crystalline sparse xdolomite, symbol PSX (R,A):D(3); medium crystalline packed xdolomite, symbol 5PX (R,A): D(4); or chert: very finely crystalline sparse xchert, SX(A):CHT(2). The xpseudosparite would correspond to pseudosparite according to the F o l k's classification (1959). From the above said the differences are noticeable between the term pseudosparite used by Folk and pseudosparite used by the author of this study. These differences indicate in which way the term pseudospar has been used to represent recrystallized limestone. In the broader sense of the word the field of application of the term pseudosparite is greater, because it may be used, or better to say introduced into the designation of highly recrystallized allochemical, microcrystalline and biohermal limestones, but in the narrower sense the term pseudosparite means highly recrystallized micrite.

There might happen — though very rarely — that for some reason the origin of sparry or microsparry calcite can neither be stated nor supposed. In such cases the term n-sparry, symbol NS, or n-microsparry calcite with the symbol NMS is suggested to be used. Those limestones, as for instance biomicrite having 10% n-sparry calcite or n-microsparry calcite can be designated as S NS 2B:LA or S NMS 2B:LA, biomicrite with 10—50% n-sparry or n-microsparry calcite can be given the symbol P NS 2B:LA or P NMS 2B:LA, biogenetic limestone with more than 50% n-sparry calcite may be classified as bionsparite, symbol NS 1B:LA, and that with more than 50% n-microsparry calcite as bionmicrosparite bearing the symbol NMS 1 B:LA.

As to biolithite (symbol (IV:L, by F o l k), this rock could be divided on the basis of its cement into two classes, i. e. to biolithomicrite for which the symbol 4:LM is suggested, and biolithosparite with the suggested symbol 4:LS. According to the degree of recrystallization biolithites can be divided into slightly recrystallized pseudosparry or pseudomicrosparry biolithomicrite bearing the symbol SR (PS or PMS) 4:LM, then to partially recrystallized pseudosparry or pseudomicrosparry biolithomicrite with the symbol PR (PS or PMS) 4:LM, and highly recrystallized pseudosparry or pseudomicrosparry biolithite, respectively biolithopseudosparite (symbol 4:LPS) and biolithopseudomicrosparite (symbol 4:LPS).

According to the degree of dolomitization limestones can be divided into the following classes: slightly dolomitized limestone with less than 10% metasomatic dolomite where the letters SD would precede the symbol designating the primary type of limestone, as for instance slightly dolomitized fossiliferous micrite bearing the symbol SD 3B:LA: then partially dolomitized limestone with 10—50% metasomatic dolomite where the letters PD would precede the symbol of the primary type of

limestone, e. g. partially dolomitized fossiliferous micrite with the symbol PD 3B:LA: finally, highly dolomitized carbonate rocks, i. e. dolomites with more than 50% metasomatic dolomite denoted with D, as for instance finely crystalline fossiliferous dolomite, symbol 5B(A):D(2).

Table 2 shows how the metasomatic (secondary) dolomites have been classified. To make out this classification part of the denominations for primary limestones as contained in Folk's classification have been used in order to make the denomination for the metasomatic dolomite show which primary limestone had undergone an intensive dolomitization. For instance: medium crystalline packed oodolomite, symbol 5 PO (A):D(4) developed as the result of an intensive dolomitization of packed oolite limestone; finely crystalline sparse biodolomite, symbol 5SB (R):D(3) developed through an intensive dolomitization of sparse biogenetic limestone: very finely crystalline pelletiferous dolomite with the symbol 5P (A):D(2) through the dolomitization of pelletiferous micrite, etc. In case one wants to stress and point out that the rocks that have undergone an intensive dolomitization had been sparitic varieties of limestone either with packed or sparse allochems, the designation and the symbols denoting poorly washed, unsorted, sorted or rounded, has to be put in brackets and behind the designation »packed« or »sparse«. In the symbol this designation will come after the character P (packed) or S (sparse), as for instance: medium crystalline packed (rounded) biodolomite, symbol 5P(R) B(A):D(4), finely crystalline sparse (poorly washed) biodolomite, symbol 5S(PW) B(A):D(3) etc. The bracketed characters (R = rudite, A = arenite and L = lutite) show the size of allochems after Folk.

Division of rocks can be made on the basis of other secondary processes as well, e. g. silicification, anhydritization, dedolomitization etc. Highly silicified anhydritized and dedolomitized carbonate rocks with their content in SiO_2, $CaSO_4$ and $CaCO_3$ (dedolomite) exceeding 50% are classified as chert (CHT), anhydrite (AH) and dedolomite (DD).

Primary dolomites, e. g. dolomicrites, can also be divided into different groups, this according to the degree of recrystallization, contained percentage of dolomitic pseudospar or pseudomicrospar, respectively. So they can be divided into: slightly recrystallized dolopseudosparry or dolopseudomicrosparry dolomicrite bearing the symbol SR (DPS or DPMS) 3M:D with less than 10% recrystallized dolomite: partially recrystallized dolopseudosparry or dolopseudomicrosparry dolomicrite, symbol PR (DPS or DPMS) 3M:D with 10—50% recrystallized dolomite, and highly recrystallized dolomite, i. e. dolopseudosparite bearing the symbol DPS 3M:D and dolopseudomicrosparite with the symbol DPMS 3M:D and more than 50% recrystallized dolomite.

What has been discussed so far refers to the classification of simple, altered lithotextural types of rocks. In case the primary lithotextural type contains a high percentage of some other allochem (according to the present author's proposal minimum 10%), then — as suggested by Folk — its denomination is added the denomination indicating the presence of that other type of allochem. For instance, partially recrystallized pseudosparry packed biointramicrite bears the symbol PR PS 2PI(B):LA, intrabiopseudosparite PS 1B(I):LA etc. However, if percentage of such other

allochem is under 10%, its presence could be indicated with the corresponding lithotextural type — e. g. slightly recrystallized (pseudosparry) fossiliferous intramicrite, symbol SR (PS) B 2I:LA, partially recrystallized (pseudomicrosparry) micropelletic biomicrite, symbol PR (PMS) MP 2B:LA, etc. A similar way of denotation can be applied to designate the terrigenous component of carbonate rocks. A division can be made so as to tell apart the carbonate rocks with less than 10% terrigenous component from those bearing 10—50% terrigenous component and from »carbonate rocks« with more than 50% terrigenous component. For instance, slightly argillaceous biopseudosparite would bear the symbol STC PS 1 B:LA, that partially sandy biopseudomicrosparite the symbol PTS PMS 1 B:LA etc.

It is proposed to adopt the common term »monoallochemical« for all allochemical carbonate rocks with a single allochem type. For instance, biodolomite is a kind of monoallochemical metasomatic dolomite. For carbonate rocks comprising two allochem types the term »biallochemical« is suggested as a general denomination; for instance, biointramicrite is a kind of biallochemical limestone. But if a carbonate rocks comprises more than two allochem types, the term »poliallochemical« is suggested as a common name.

Now, in case a carbonate rock has undergone two or more secondary processes, e. g. recrystallization, dolomitization or silicification, dedolomitization, anhydritization etc., it is a must to determine the succession in which they had developed. It is suggested that the denomination and the designation be followed from the right to the left starting from the very symbol of a given lithotexture, the later, posteriorly developed process following always on the left from the antecedent one. For instance, partially dolomitized, slightly recrystallized pseudomicrosparry micrite would bear the symbol PD(3), SR PMS 3M:L, that slightly dolomitized, slightly clayey biointramicrite SD (4) STC 2I(B):LA, slightly anhydritized sparse biodolomite, SAH 5SB(A):D(3) etc.

The proposed classifications are based on indication of the quantitative relations of monotype secondary matter. Therefore in the cases where heterogeneous secondary matter is present one meets with the terminologic problem of how to show the secondarity or primarity of a rock with $>50\%$ of the secondary minerals present, none of which exceeds the value of 50% individually. In this connection it is necessary to make a distinction in classification of the rock that has undergone such changes, showing the difference with regard to individual quantities of secondary matter to total quantity of all secondary matter present in the rock. For instance, it is necessary to distinguish the partially dolomitized, partially recrystallized biomicrite with $>50\%$ of the secondary altered matter (i. e. »secondary limestone« — symbol PD, PR (HAL) 2B:LA) from the partially dolomitized, partially recrystallized biomicrite with $<50\%$ of the secondary matter (which is »primary limestone« — symbol PD, PR (PAL)2B:LA).

As it is possible to classify carbonate sediments according to the intensity of their recrystallization, dolomitization, etc., so the allochemical limestones may be classified according to their cementation degree into 3 groups: slightly cemented limestones with less than 10% of sparry or

microsparry calcite; partially cemented limestones with 10—50% of sparry of microsparry calcite; and highly cemented-sparry or microsparry varieties of allochemical limestones with more than 50% of sparry or microsparry calcite. For example: slightly cemented (epi)sparry biomicrite-symbol SCEM (EP)S 2B:LA; partially cemented (syn)microsparry sparse biomicrite-symbol PCEM (SYN)MS 2SB:LA; biosparite-symbol S 1B:LA; unsorted biomicrosparite-symbol MS 1USB:LA; etc.

BITUMEN AND BITUMINOUS ROCKS

The term »bitumen« has different meanings: in a narrower sense in denotes a black to dark brown, sticky, under normal temperature solid or semi-solid amorphous matter composed mostly of hydrocarbons (e. g. of aromatic, naphthenic or paraffinic classes); and then of oxygen, sulphur and nitrogen; in a broader sense bitumens are also gas, oil, pitches (ozocerites) and asphalts. Rocks containing bitumen in a relatively high concentration are denominated as bituminous rocks. To classify a rock as a bituminous one it is necessary to determine its bitumen contents, which must be above the average percentage — the clarke — of bitumen contained in the rocks of the studied region (according to Uspenskij et al. (1949), the bitumen clarke for sedimentary rocks is approximately 0.03%. The bitumen concentration in rocks is described as low (symbol LC) if under 5%, medium (symbol MC) if ranging from 5 to 10%, and relatively high (symbol HC) if exceeding 10%. The stated values are conditioned by the porosity abundance.

Their origin is described as syngenetic if they had developed during sedimentogenetic and diagenetic stages of the enclosing rocks, respectively as epigenetic if they had migrated from or into the sediments in which they occur during the epigenetic stage (Florovskaja, 1957). The syngenetic bitumens (symbol SYNB) and epigenetic bitumens (symbol EPB) may occur within a rock concurrently. Such concurrence may mean that the epigenetic bitumen has developed by transformation of the syngenetic one.

Syngenetic bitumens are characterized by a uniform distribution within intergranular and intercrystal pores; migration from the rock into fracture; presence of dispersed organic matter coming in conjunction with the bitumen of such type; a uniform concentration, etc. Epigenetic bitumens are characterized by being associated with open pores (fractures, caverns, etc.) and by absence of an obvious association with the dispersed organic matter; by migration from the pore into rock; by a variable concentration, etc. Studying syngenetic bituminous rocks in Western Europe, Bitterli (1963) came to the conclusion that bitumen is not associated with a single rock type but is found with different sedimentary rocks: clays, shales, siltstones, sandstones, anhydrites, marls and carbonate rocks.

When determining the bitumen genesis it is also necessary to determine the form in which it occurs in a rock, respectively it is necessary to determine the bituminous structure which may be uniform (symbol

UF), selective-filled (symbol SF), lenticular (symbol LN), stratified (STF, and laminar symbol LAM — author's observation), cavernous (symbol CV), fractured (symbol FR), cement-like (symbol CL), fragmental (symbol FG, or brecciated, symbol BR), dotty (symbol DT), biomorphic (symbol BM) and rhytmical (symbol RH) (Florovskaja & Melkov, 1948).

Besides determining the bitumen concentration, origin, and structure, it is also necessary to define its type and order. By the colour of luminiscence of the soluble bituminous matter (Soboleva, 1970) distinguished are the following bitumen types or fractions: pitchy-asphaltic (symbol PABA);[1] pitchy (symbol PBA);[1] oily-pitchy (symbol OPBA);[1] oily (symbol OBA);[1] and light (symbol LBA).[1] Bitumen may be of oil (symbol OL) or sapropelic-coal (symbol SPC) order.

Depending on the method of the bitumen extraction from bituminous rock distinguished are (after Florovskaja, 1957) the following bitumen varieties: bitumen A (or free bitumen, symbol BA),[2] bitumen C (or bound bitumen — symbol BC),[2] and the bitumen B (symbol BB).[2] According to Florovskaja, the quantity of free bitumen (A) in rocks ranges from 0 to 18% or more, while the percentage of bound bitumen (C) does not exceed 0.15%. While free bitumen most frequently occurs in fractures, fissures, stylolites and in intercrystal and intergranular pores, bound bitumen occurs in pores within mineral rocks (intracrystal porosity).

CLASSIFICATIONS OF BITUMINOUS CARBONATE ROCKS

The present author classified (Šebečić, 1976) bituminous carbonate rocks of External Dinarides (Table 4) according to their textural and structural characteristics into laminated bituminous carbonate rocks (having or lacking stromatolites), non-laminated bituminous carbonate rocks, bituminous intraformational conglomerates and breccias, and into bituminous tectonic breccias; and according to their mineral respectively chemical composition they were classified by the author into bituminous limestone rocks and bituminous dolomitic rocks. In addition to these basic bituminous carbonate rock types there are, or are possible, also some transitional varieties such as bituminous brecciated and conglomeratic carbonate rocks and bituminous breccia-conglomerates. Their further division has been based on Folk's classifications of carbonate rocks (1959 and 1962) which were modified for recrystallized limestones and dolomites by this author in 1973. A more detailed classification of stromatolites may be made on the basis of the classification given by Logan et al. (1964). It is recommendable to make denomination of bituminous carbonate rocks also following Dunham's classification (1962, modified by the Royal Dutch Shell Company in 1964) considering the fact that this classification was used in the field work.

[1] Symbols based on translation from Russian into English; but the symbol for »bitumen« could also be BT (e. g. BA — alt. BTA).

[2] Symbols based on translation from Russian into English; but the symbol for »bitumen« could also be BT (e. g. BA — alt. BTA).

In a more detailed division of bituminous carbonate rocks one may in addition to the mentioned rock characteristics (their mineral — chemical — composition, structure and texture) take into consideration also their other characteristics, such as bitumen and porosity. For the bituminous rock classification the author deems the method based on division of bitumen-containing rocks and division of bitumen types to be the most practical one; but for the study of rocks concerning their collector properties he finds more complete a classification based not only on the division of rocks but also on the pore classification. The following are examples of some simpler divisions of bituminous carbonate rocks: epibituminous dolomitic tectonic breccia (symbol EPB D TCBR); epibituminous biogenic limestone-packstone (symbol EPB BL — p); synbituminous dolomite (SYNB D); syn-epibituminous stromatolitic limestone (SYN — EPB, STL L), etc.

COMPLEX CLASSIFICATIONS OF BITUMINOUS CARBONATE ROCKS

If one wants to point out in a classification the most significant bitumen type and its concentration as well as the respective rock type, such classification will inevitably have to be more detailed. For example, epibituminous (pitchy, 2.1‰) slightly recrystallized sparse biomicrite (wackestone), symbol EPB (PBA, LC) SR 2SB:LA (w); epibituminous (pitchy, 9.79‰) calcareous tectonic breccia, symbol EPB (PBA, MC-HC) C TCBR; synbituminous (pitchy-asphaltic, 0,04‰) medium crystalline dolomite, symbol SYNB (PABA, LC) 5D (4); syn-epibituminous (asphaltic, 2,95‰) laminated limestone (fossiliferrous micrite/biomicrite), symbol SYN-EPB (ABA, LC) LAM (3B:LA/2B:LA); syn-epibituminous (pitchy and oily-pitchy, 0,02—3,26‰) laminated stromatolitic limestones, symbol SYN-EPB (PBA, OPBA, LC) LAM STL L; etc.

An even more complex classification of bituminous rocks will be obtained if in addition to the rock and bitumen type also the genetic pore type is introduced (e. g. according to Choquette & Pray's classification, 1970). — Choquette & Pray have proposed a more detailed porosity classification (adopted by the present author with some slight additions). They have divided the primary porosity (symbol P) into pre-depositional (symbol Pp) and depositional (symbol Pd) porosity; the secondary (symbol S) or post-depositional porosity is divided by them into eogenetic (symbol Se), mesogenetic (symbol Sm) and telogenetic (symbol St) porosity.

Choquette & Pray (1970) distinguish 15 bassical porosity types: 1. interparticle (BP),[3] 2. intraparticle (WP),[3] 3. intercrystal (BC),[3] 4. moldic (MO), 5. fenestral (FE), 6. shelter (SH), 7. growth framework (GF), 8. fracture (FR), 9. channel (CH), 10. vug (VUG), 11. cavern (CV), 12. breccia (BR), 13. boring (BO), 14. burrow (BU) and 15. shrinkage (SK). Fenestral, shelter and breccia porosity are varieties of interparticle porosity and are distinguished from it by a larger pore size. Of these the fracture, vug,

[3] To facilitate recognition and construction of letter symbols the authors have substituted the preposition »inter« with »between« (B) and »intra« with »within« (W).

TABLE—*TABELA III* CLASSIFICATION OF METASOMATIC DOLOMITES
KLASIFIKACIJA METASOMATSKIH DOLOMITA

type of allochems *tip alokema*	percent allochems *postotak alokema*	> 50	50 — 10	< 10	without allochems *bez alokema*	
	intraclasts *intraklasti*	(x) packed intradolomite (x) *intradolomit sa zbijenim alokemima* 5 PI (R or A) : D(x)	(x) sparse intradolomite (x) *intradolomit s razasutim alokemima* 5 SI (R od A) : D(x)	(x) intraclast-bearing dolomite (x) *intraklastični dolomit* 5 I (R od A) : D(x)		
	oölites *ooliti*	(x) packed oödolomite (x) *oodolomit sa zbijenim alokemima* 5 PO (R or A) : D(x)	(x) sparse oödolomite (x) *oodolomit sa razasutim alokemima* 5 SO (R or A) : D(x)	(x) oölite-bearing dolomite (x) *oolitični dolomit* 5 O (R or A) : D(x)		
	fossils *fosili*	(x) packed biodolomite (x) *biodolomit sa zbijenim alokemima* 5 PB (R od A) : D(x)	(x) sparse biodolomite (x) *biodolomit sa razasutim alokemima* 5 SB (R od A) : D(x)	(x) fossiliferous dolomite (x) *fosiliferni dolomit* 5 B (R, A od L) : D(x)	(x) crystalline dolomite (x) *kristalasti dolomit* 5 D(x)	(x) biolithodolomite (x) *biolitodolomit* 5 BL : D(x)
	pellets *peleti*	(x) packed peldolomite (x) *peldolomit sa zbijenim alokemima* 5 PP(A) : D(x)	(x) sparse perdolomite (x) *peldolomit sa razasutim alokemima* 5 SP (A) : D(x)	(x) pelletiferous dolomite (x) *peletični dolomit* 5 P(A) : D(x)		

(x) = aphanitic (1), very finely (2), finely (3), medium (4), coarsely (5), very coarsely (6) and extremely coarsely crystalline (7); R = rudite, A = arenite and L = lutite. Medians for allochems of ruditic, arenitic and lutitic sizes are adopted from Folk (1959 and 1962).

An appropriate term is recommended for the metasomatic dolomite with uniform allochem contents, i. e.: finely crystalline sparse biopeldolomite, symbol 5 SPB(A) : D(3), medium crystalline packed biooödolomite, symbol 5 POB(R) : D(4).

(x) = afanitski (1), vrlo sitno (2), sitno (3), srednje (4), krupno (5), vrlo krupno (6) i ekstremno krupno (7) kristalasti; R = ruditi, A = areniti i L = lutiti. Medijani za alokeme ruditnih, arenitnih i lutitnih veličina preuzeti su od Folka (1959 i 1962).

Za metasomatski tip dolomita sa podjednakim količinama alokema preporuča se i odgovarajući naziv: npr. sitnokristalasti biopeldolomit sa razasutim alokemima, simbol 5 SPB(A) : D(3), srednjekristalasti biooodolomit sa zbijenim alokemima, simbol 5 POB(R) : D(4) itd.

TABLE—*TABELA* IV

CLASSIFICATION OF BITUMINOUS CARBONATE ROCKS*
*KLASIFIKACIJA BITUMINOZNIH KARBONATNIH STIJENA**

I BITUMINOUS LAMINATED CARBONATE ROCKS
BITUMINOZNE LAMINIRANE KARBONATNE STIJENE
with stromatolitic texture**
*sa stromatolitnom građom***
Bituminous laminated stromatolitic limestones — biolithites
Bituminozni lominirani stromatolitni vapnenci — biolititi
Bituminous laminated stromatolitic dolomites — biolithodolomites
Bituminozni laminirani stromatolitni dolomiti — biolitodolomiti
with non-stromatolitic texture
bez stromatolitne građe
Bituminous laminated limestones — predominantly alternation of biogenic (biomicritic) and microcrystalline (fossiliferous-micritic) laminae
Bituminozni laminirani vapnenci — pretežno izmjena biogenih (biomikritnih) i mikrokristalastih (fosiliferno-mikritnih) lamina
Bituminous laminated dolomites
Bituminozni laminirani dolomiti

II BITUMINOUS NON-LAMINATED CARBONATE ROCKS
BITUMINOZNE NELAMINIRANE KARBONATNE STIJENE
Bituminous (non-laminated) limestones
Bituminozni (nelaminirani) vapnenci
Bituminous allochemical and microcrystalline limestones
Bituminozni alokemijski i mikrokristalasti vapnenci
Bituminous (non-laminated) dolomites
Bituminozni (nelaminirani) dolomiti

III BITUMINOUS CONGLOMERATES**
*BITUMINOZNI KONGLOMERATI***
Bituminous calcareous (intraformational) conglomerates
Bituminozni vapnenački (intraformacijski) konglomerati
Bituminous dolomitic (intraformational) conglomerates
Bituminozni dolomitni (intraformacijski) konglomerati

IV BITUMINOUS BRECCIAS
BITUMINOZNE BREČE
Bituminous calcareous breccias
Bituminozne vapnenačke breče
Bituminous calcareous (intraformational**) breccias
*Bituminozne vapnenačke (intraformacijske**) breče*
Bituminous calcareous tectonic breccias
Bituminozne vapnenačke tektonske breče
Bituminous dolomitic breccias
Bituminozne dolomitne breče
Bituminous dolomitic (intraformational**) breccias
*Bituminozne dolomitne (intraformacijske**) breče*
Bituminous dolomitic tectonic breccias
Bituminozne dolomitne tektonske breče

* For further detailing of carbonate rock classifications it is recommendable to use as a basis the classifications given by Folk (1959, or 1962), Dunham (1962, mod. 1964) or Šebečić (1973), while more detailed stromatolitic rock classifications may be made after Logan et al. (1964).
* *Ako se žele dobiti još detaljnije podjele karbonatnih stijena preporučljivo je kao osnovu uzeti klasifikacije Folka (1959, ili 1962), Dunhama (1962, mod. 1964) ili Šebečića (1973), a za stromatolitne karbonatne stijene podjelu Loganaet al. (1964).*
** These bituminous rock types occur less frequently.
** *Ovi tipovi bituminoznih karbonatnih stijena rjeđe se nalaze.*

intercrystal, interparticle and intraparticle porosity are the most widespread types. But between pores and pore systems there are also transitional and gradational types; for instance, fracture porosity may grade into breccia porosity, intercrystal into vug or channel porosity, etc.

The Choquette & Pray (1970) classification leaves out intracrystal pores and stylolites. But while intracrystal pores (WC) are rarely found in carbonate rocks, the stylolite (symbol STYL) occurrence in these sediments is both frequent and specific. The stylolite genesis is associated with solutional processes on fissures and fractures under pressure and that of intracrystal pores with inclusions, cleavages (syngenetic pores) and deformational fractures (epigenetic pores).

In the rocks of the studied region encountered are most frequently two or more pore types (bipore system, or polypore system); there are sometimes also their gradations.

Various authors slightly differ in evaluation of the carbonate rock porosity, which mostly refers to their evaluation of more porous rocks. As low-porosity carbonate rocks, symbol LP(OR) classified are those with (effective) porosity under 5%. Medium-porous carbonate rocks, symbol MP(OR) are considered to be those with the porosity ranging from 5—10% (—20%), and highly porous carbonate rocks, symbol HP(OR) have porosity range between 10 and (—20%). These figures are in conformity with the values of porosity degree obtained by examining the carbonate rock texture on a thin section.

The following are some examples of an even more complex bituminous rock classification: epibituminous, mesoporic biomicrite — symbol EPB MEP 2B:LA, or: epibituminous biomicrite, mesoporic (= of the mesogenetic porosity type) — symbol EPB 2B:LA, MEP. — The term »mesoporic« (symbol MEP) used as an abbreviation of the terms derived from »mesogenetic«+»pore« should be distinguished from the term »mesopore« (symbol MSP) used to denote the pore size; synbituminous predeporic (= of the predepositional porosity type) biomicrudite — symbol SYNB PDEP 2B:LR; epibituminous teloporic (= of the telogenetic porosity type) calcareous tectonic breccia — symbol EPB TEP C TCBR; synbituminous deporic (= of the depositional porosity type) calcareous conglomerate — symbol SYNB DEP C CGL; and so on.

Even such a complex classification can be made more detailed if completed with the data on the basic pore type, pore size, shape and percentage, adding such data in brackets to the genetic pore type or after the lithologic symbol. For example: epibituminous (pitchy, 4,39%) mesopore (intercrystal and fracture, 6,10%) medium-crystalline dolomite — symbol EPB (PBA, LC) MEP (BC, FR, MP(OR) 5D (4) — and similar. In the same way it is possible to classify also non-bituminous carbonate rocks in the study of their porosity, permeability and other lithophysical properties.

Having in mind the elements on which the proposed classification of bituminuos rocks is based — these being the bitumen and carbonate rock type (in complex classifications also the pore type) — the author considers the same classification applicable to bituminous carbonate rocks of other regions as well.

The symbols representing the classified rocks can be directly used as codes in computer data processing. On card punchers with alphanumeric and other characters used have been capital letters to denote symbols. For the same reason the Roman symbols contained in F o l k's symbols denotig carbonate rocks have been replaced by the Arabic ones.

A choice of photographs showing lithotextural types of the studied Dinaric carbonate rocks is given on the Plates I—XIV.

CONCLUSION

The proposed classifications of recrystallized, dolomitized and bituminous rocks are a result of the author's studying carbonate rocks of the Dinarides for a number of years. They have been developed in answer to the need for more complete classifications of the analysed rocks to enable their better correlation.

One of the basical elements in these classifications are denominations of primary lithotextural types as used by F o l k (1959, 1962). It has been done to make it possible — from the proposed denominations of lithotextural types — to draw conclusions as to which primary lithotextural types have undergone recrystallization, dolomitization, bituminization, or other secondary processes.

For example: packed to sparse biointrapseudomicrosparite — symbol P—S PMS 1 I(B):LA (Plate I, Fig. 1); partially recrystallized pseudosparry pseudointramicrite symbol PR PS P 2I:PLA (Plate I, Fig. 2); slightly recrystallized pseudosparry dismicrite — symbol SR PS 3MX:L; very finely-to-finely crystalline sparse intradolomite — symbol 5SI (A,R):D (2—3) (Plate IV, Fig. 4); very finely crystalline pseudopelletiferous dolomite — symbol 5PP(PA): D (2) (Plate IV, Fig. 2); zonal, coarsely crystalline dolomite — symbol Z 5:D (5), ndolomicrosparite — symbol N DMS 3M:D (Plate IV, Fig. 1); synepibituminous (pitchy-asphaltic, low-to-medium concentration) laminated micrite, symbol SYN-EPB (PABA, L-MC) LAM 3M:L, synbituminous (oily-pitchy, 0,08% laminated finely crystalline dolomite, symbol SYNB (OPBA, VLC) LAM 5D (3), (Plate VIII, Fig. 3); epibituminous (medium concentration) partially sandy sparse intramicrite, symbol EPB (MC) PTS 2SI:LA, and so on.

Where carbonate rocks have undergone two or more secondary processes such lithotextural type denominations may appear too detailed; however, one should not forget that a detailed description — respectively classification — cannot be made without particularities giving the required information. Still, even the longest denomination will be shorter than a descriptive representation. If it is wished to make denominations of the analysed lithotextural types simpler it may be done by omitting the adjectives showing the secondary processes or lithotextural types, indicating by symbols all characteristics of the studied lithotextures. These symbols are sufficient basis for reconstruction of the complex lithostructural denomination. For example, recrystallized biomicrite — symbol PR PS (PPH, BLD, 3) 2B:LA — is an indication that it has been partially recrystallized, its recrystallized calcites porphyroid, bladed, and of a size

exceeding 0,020 mm but under 0,062 mm. In that way the complex classifications may be simplified and thereby made accessible to wider circles of geologic experts.

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Klasifikacija rekristaliziranih, dolomitiziranih i bituminoznih karbonatnih stijena

B. Šebečić

Po predloženim klasifikacijama (tabela 2 i 3) izmijenjene stijene podijeljene su općenito prema vrsti i količini neke tvari koja je nastala sekundarnim procesom na: primarne i na sekundarne. Granična vrijednost u količini neke izmijenjene tvari za njihovo razlikovanje je 50%.

Primarna grupa karbonatnih stijena podijeljena je u dvije podgrupe, i to: na slabo izmijenjene karbonatne stijene sa manje od 10% neke izmijenjene tvari i na djelomično izmijenjene karbonatne stijene sa 10—50% neke izmijenjene tvari. Primarna grupa izmijenjenih karbonatnih stijena zadržava svoj naziv i simbol iz postojećih klasifikacija primarnih karbonatnih stijena (Folk, 1959 i 1962), a pridodaje joj se naziv i simbol za stupanj izmjene; npr. slabo rekristalizirani pseudomikrosparni biointramikrit sa razasutim alokemima (simbol SR PMS 2SI (B):LA), djelomično dolomitizirani biomikrudit (PD 2B:LR, tabla 4, sl. 3) i sl.

Za sekundarnu grupu karbonatnih stijena, koje su u stvari jako izmijenjene karbonatne stijene, izvršena je odgovarajuća dopuna ili promjena naziva strukturnih tipova Folkove klasifikacije npr. oopseudosparit sa zbijenim alokemima — tabla 2, sl. 2 — (simbol P PS 1O:LA), biointrapseudomikrosparit (simbol PMS 1I(B):LA) — tabla 1, sl. 1, dolopseudomikrosparit (simbol D PMS 3 M:D) i dr.

Obzirom na količinu neke sekundarne tvari u karbonatnoj stijeni postoji razlika u imenovanju naziva karbonatne stijene između Folkove klasifikacije (1959) i predložene klasifikacije. Folk za karbonatnu stijenu sa manje od 10% metasomatskog dolomita — a vjerojatno bi bilo i za manje od 10% bilo koje sekundarne tvari — ne uvodi poseban naziv, za razliku od autora; tako da, ako se to posebno opisno ne naglasi, iz naziva biomikrit ne može se znati da li je biomikrit zahvaćen rekristalizacijom, dolomitizacijom i sl. Predloženom klasifikacijom izrazima: slabo rekristalizirani, slabo dolomitizirani i sl., žele se i nazivom odvojiti karbonatne stijene koje su rekristalizirane, dolomitizirane i sl. od onih koje to nisu. Na sličan način podijeljene su karbonatne stijene i prema količini terigene tvari, tako da se već nazivom mogu razlikovati karbonatne stijene koje sadrže terigenu tvar od karbonatnih stijena koje je ne sadrže. — Za karbonatne stijene sa više od 10%, a manje od 90% dolomita ili rekristaliziranog kalcita Folk uvodi

naziv dolomitizirani ili rekristalizirani npr. biomikrit, dok autor predlaže raspon do 50%. Navedene izmjene u stupnjevanju određenog sekundarnog procesa ne predlažu se s namjerom da se »skrati« raspon određenog sekundarnog procesa, čak naprotiv, raspon sekundarnog procesa je proširen u predloženom imenovanju za karbonatne stijene sa manje od 10% izmjenjene tvari, već da se »poboljša« podjela jače izmijenjenih karbonatnih stijena. Predlaže se da se uvedu nazivi, odnosno pridjevi, koji označavaju količinu alokema iznad ili ispod određene granice; npr. oolitni vapnenac s više od 10% oolita i oolitičan vapnenac s manje od 10% oolita, nadalje peletni (sa >10% peleta) i peletičan (sa <10% peleta), ali biogeni (sa >10% fosila) i fosiliferan (sa <10%). To je prijedlog, ali i jezični problem o kome treba raspravljati sa filolozima. Isto kao što se aproksimativna granica u količini dolomita između vapnenaca i dolomita pretežno uzima 50% dolomita, tako je predložena i aproksimativna granica 50% pseudospari ili pseudomikrospari kalcita između djelomično rekristaliziranih primarnih vapnenaca i jako rekristaliziranih vapnenaca, tj. sekundarnih vapnenaca. Za aproksimativnu granicu u veličini rekristaliziranog kalcita, tj. između pseudospara i pseudomikrospara, uzeta je veličina 20μ (a ne 15 ili 31μ) radi lakše reinterpretacije litostruktura Folkove klasifikacije u Dunhamovu klasifikaciju (1962) razrađenu po Shellu (1964), koja je vrlo praktična pri terenskim istraživanjima.

Za predloženu klasifikaciju metasomatskih dolomita, baziranoj na reliktnoj strukturi i stupnju kristaliniteta (tabela 3), upotrebljeni su također dijelovi naziva Folkove klasifikacije vapnenaca, kako bi se po nazivu metasomatskog dolomita moglo ustanoviti koji je vapnenački talog bio zahvaćen jakom dolomitizacijom. Npr. vrlo sitno-sitnokristalasti intradolomit sa razasutim alokemima, simbol 5 SI(A, R):D(2—3) nastao je jakom dolomitizacijom intramikrita sa razasutim intraklastima arenitnih i ruditnih dimenzija — tabla 4, sl. 4, srednjekristalasti fosiliferni dolomit, simbol 5B(A):D(4) nastao je jakom dolomitizacijom fosilifernog mikrita itd.

Bituminozne karbonatne stijene Vanjskih Dinarida (tabela 4) podijelio je autor (Šebečić, 1976) prema njihovim strukturno-teksturnim osobinama te prema njihovom mineralnom, odnosno kemijskom sastavu. Složenost podjele bituminoznih karbonatnih stijena povećava se, ako se pri podjeli uzimaju u obzir podjele bitumena i pora stijene u kojima se bitumen nalazi. Evo nekoliko primjera jednostavnije podjele bituminoznih karbonatnih stijena: epibituminozna vapnenačka tektonska breča, simbol EPB C TC BR — tabla 9, sl. 2 i tabla 12, sl. 2; sinbituminozni laminirani dolomit, simbol SYNB LAM D — tabla 8, sl. 3; sin-epibituminozni laminirani stromatolitni vapnenac, simbol SYN-EPB LAM STL L — tabla 10, sl. 1 — i dr., te složenije podjele: epibituminozna (6,46%) slabo pjeskovita vapnenačka (fosiliferno-mikritska) tektonska breča, simbol EPB (MC) STS C (3B:LA) TC BR — tabla 9, sl. 3 i tabla 13, sl. 2; sinbituminozni (smolasto-asfaltni, 1,94%) laminirani srednjokristalasti dolomit, simbol SYNB (PABA, LC) LAM 5 D(4) — tabla 11, sl. 2; epibituminozni (s vrlo niskom, tj. manjom od 0,2% a većom od 0,03% koncentracijom bitumena, 0,07%), teloporni (pukotinski, 2,5%), djelomično (epigenetski) cementirani (sparni), slabo rekristalizirani (pseudomikrosparni) fosiliferni mikrit (mudstone), simbol EPB (VLC), TEP (FR, LP) P (EP) CEM (S), SR (PMS) 3B:LA (M) — tabla 9, sl. 4 itd.

Ukoliko želimo pojednostaviti nazive analiziranih tipova stijena, činimo to tako da izostavimo pridjeve koji ih detaljiziraju, dok simbolima prikažemo sve njihove značajke. Tako npr. posljednji primjer složene podjele bituminozne karbonatne stijene možemo pojednostaviti ovako: (epi) bituminozni fosiliferni mikrit-mudstone, a iz njegovog detaljnog simbola EPB (VLC), TEP (FR, LP), P (EP) CEM (S), SR (PMS) 3B:LA (M) možemo lako dešifrirati da se (vrlo) niska koncentracija epibitumena nalazi u pukotinama koje su nastale u telogenetskoj fazi (i koje su djelomično cementirane spari kalcitom) u fosilifernom mikritu — mudstoneu — zahvaćenom slabom rekristalizacijom. Na taj način složena podjela postaje jednostavnija i pristupačnija širem krugu geoloških stručnjaka.

PLATE — TABLA I

1 Packed to sparse biointrapseudomicrosparite; symbol P-S PMS 1I(B):LA. Albian-Cenomanian; Brna, the Island of Korčula; N, 40x.

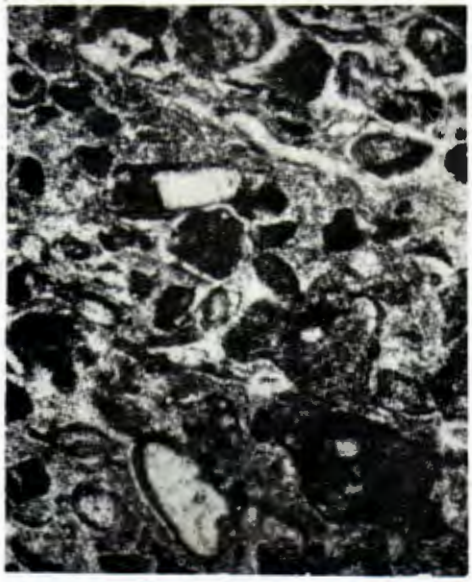
Biointrapseudomikrosparit sa zbijenim do razasutim alokemima, simbol P-S PMS 1I(B):LA. Alb-cenoman; Brna, otok Korčula; N, 40x.

2 Partially recrystallized pseudosparry pseudointramicrite; symbol PR PS P 2I:PLA. Lias-Dogger; Mali Vrh near Makarska; N, 40x.

Djelomično rekristalizirani pseudosparni pseudointramikrit, simbol PR PS P 2I:PLA. Lijas-doger; Mali Vrh kod Makarske; N, 40x.

3 Slightly silicified sparse — packed intrapseudomicrosparite; symbol SSI (S-P) PMS 1 I:LA. Lower Cretaceous; the Island of Cres; +N, 40x.

Slabo silicificirani intrapseudomikrosparit sa razasutim — zbijenim alokemima; sambol SSI (S-P) PMS 1I:LA. Donja kreda; otok Cres; +N, 40x.



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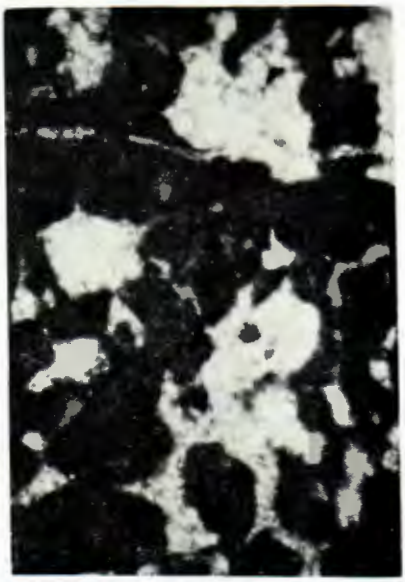

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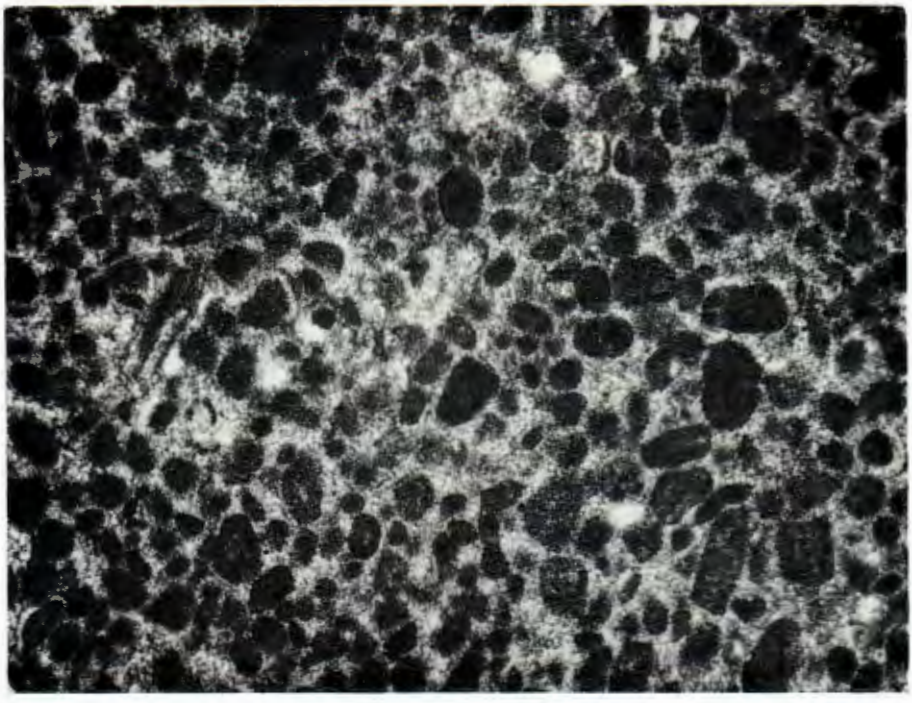

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PLATE — TABLA II

1 Slightly recrystallized sparse biomicrudite, simbol SR 2SB:LR; traces of bitumen in the fracture along the fragment margins and in the upper corner of the photograph. Senonian; Akrap; +N, 40x.

Slabo rekristalizirani biomikrudit sa razasutim alokemima simbol SR 2SB:LR. Tragovi bitumena u prslini uz rubove fragmenata u gornjem desnom uglu slike. Senon, Akrap; +N, 40x.

2 Packed oopseudosparite; symbol PPS 1O:LA; Lias, Donji Logatec — Debeli Vrh.

Oopseudosparit sa zbijenim alokemima, simbol PPS 1O:LA; Lijas, Donji Logatec — Debeli Vrh.

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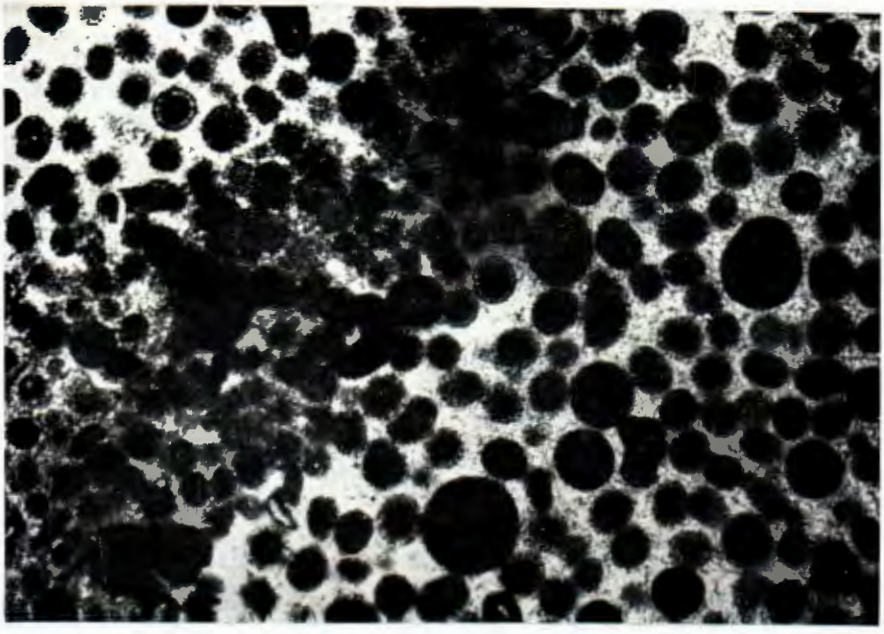

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PLATE — TABLA III

1 Fossiliferous pseudomicrosparite; symbol PMS 3B:LA. Upper Cretaceous; Ravni Kotari 1; N, 40x.

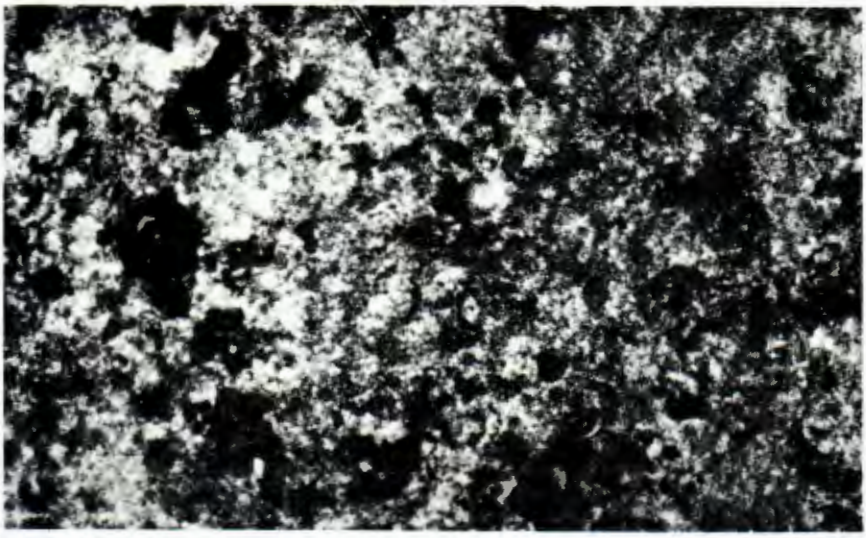
Fosiliferni pseudomikrosparit; simbol PMS 3B:LA. Gornja kreda; Ravni kotari 1; N, 40x.

2 Slightly recrystallized pseudomicrosparry micrite; symbol SR PMS 3M:L. Valanginian; Radulići, the Island of Mljet; N, 35x.

Slabo rekristalizirani pseudomikrosparni mikrit; simbol SR PMS 3M:L. Valendis: Radulići, otok Mljet; N, 35x.

3 Slightly recrystallized pseudosparry dismicrite; symbol SR PS 3MX:L. Hauterivian; Brna, the Island of Korčula; N, 35x.

Slabo rekristalizirani pseudosparni dismikrit; simbol SR PS 3MX:L. Otriv; Brna otok Korčula; N, 35x.



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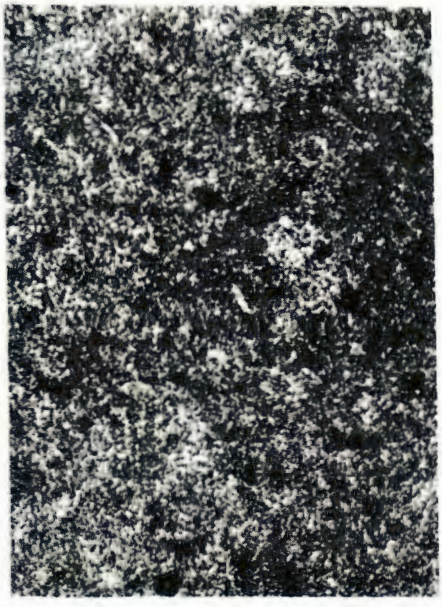

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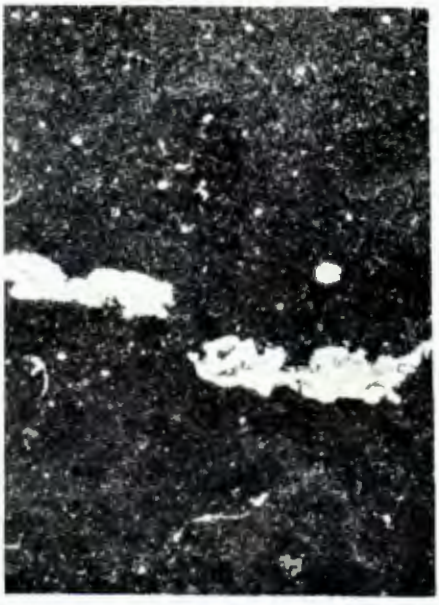

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PLATE — TABLA IV

1 Ndolomicrosparite; symbol N DMS 3M:D. Lias; Tršće—Crni Lazi; N, 10x.

Ndolomikrosparit; simbol N DMS 3M:D. Lijas; Tršće—Crni Lazi; N, 10x.

2 Very finely crystalline pseudopelletiferous dolomite; symbol 5PP(PA):D(2). Albian—Cenomanian; Brna, the Island of Korčula, N, 35x.

Vrlo sitnokristalasti pseudopeletični dolomit; simbol 5 PP(PA):D(2). Alb-cenoman, Brna, otok Korčula; N, 35x.

3 Partially dolomitized biomicrudite; symbol PD 2B:LR. Senonian; the Island of Murter; +N, 40x.

Djelomično dolomitizirani biomikrudit; simbol PD 2B:LR. Senon; otok Murter; +N, 40x.

4 Very finely-to-finely crystalline sparse intradolomite; symbol 5SI(A,R)):D(2—3). Upper Triassic; Perutac, Čabulja near Mostar; N, 20x.

Vrlo sitno do sitnokristalasti intradolomit sa razasutim alokemima; simbol 5SI(A,R):D(2—3). Gornji trijas; Perutac, Čabulja kod Mostara; N, 20x.

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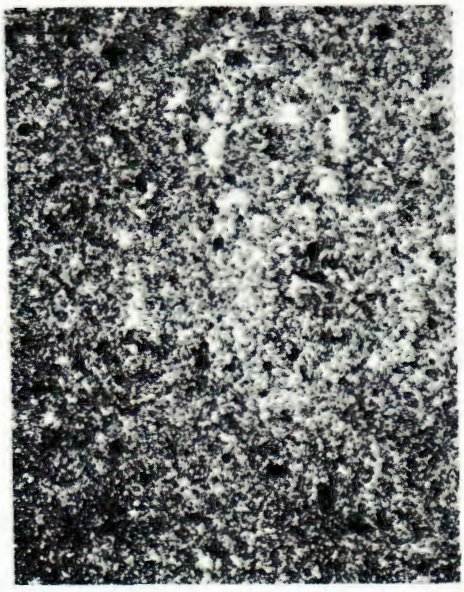

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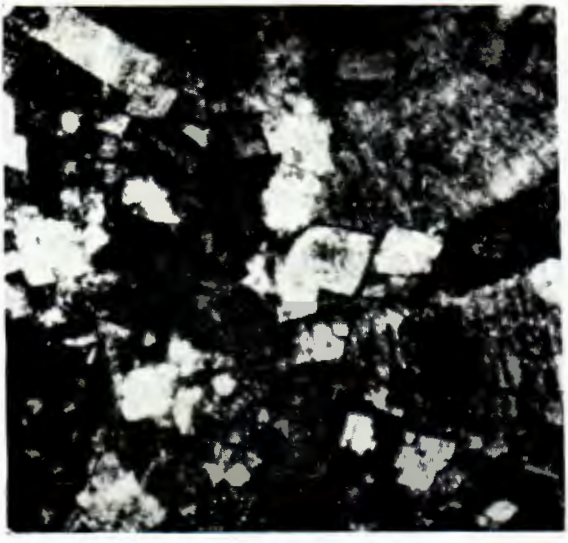

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PLATE — TABLA V

1 Very finely-to-medium crystalline biolithodolomite with antigravitationally oriented laminae and cabbage-head structure; symbol 5BL:D(2—4); Upper Triassic; Perutac, Čabulja near Mostar; N, 20x.

Vrlo sitno do srednjekristalasti biolitodolomit s antigravitacijskom laminacijom i teksturom glave kupusa, simbol 5BL:D(2—4). Gornji trijas; Perutac, Čabulja kod Mostara; N, 20x.

2 Very finely to medium crystalline biolithodolomite; symbol 5BL:D(2—4); Upper Triassic; Šanski Most—Kukavica; N, 20x.

Vrlo sitno do srednjekristalasti biolitodolomit, simbol 5BL:D(2—4). Gornji trijas; Sanski Most—Kukavica; N, 20x.

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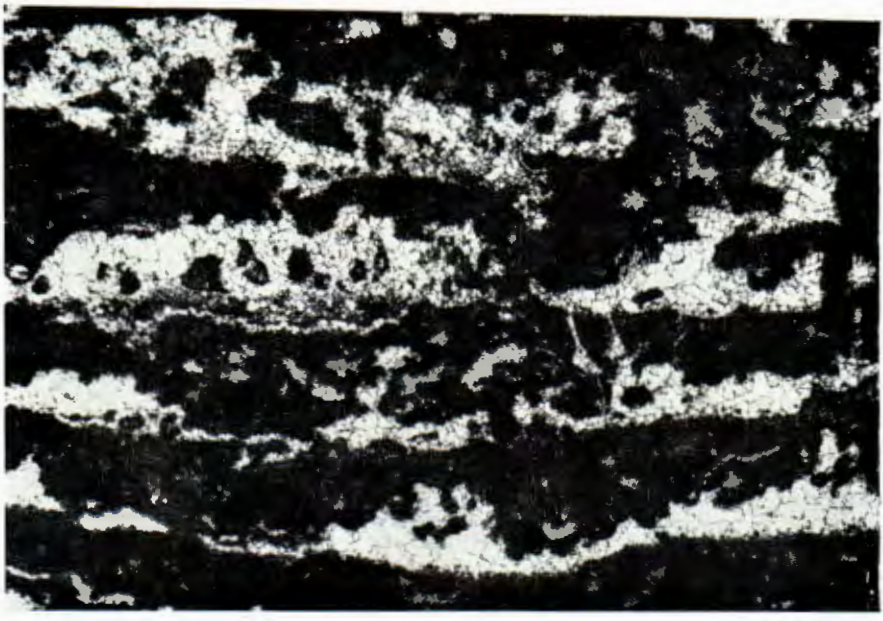

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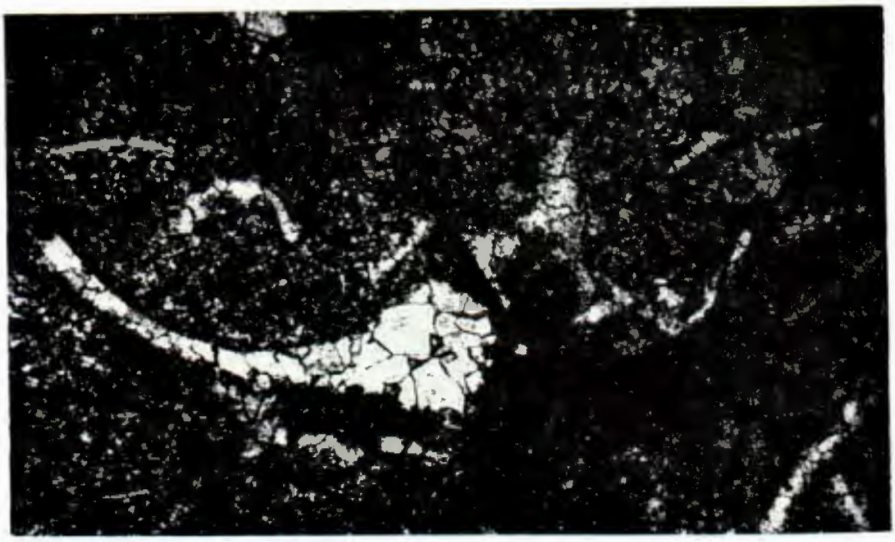
PLATE — TABLA VI

1 Medium-to-finely crystalline sparse biodolomite; symbol 5SB(R):D(4–3). Upper Triassic — Lias; Tršće—Crni Lazi; N, 20x.

Srednje do sitnokristalasti biodolomit sa razasutim alokemima; simbol 5SB(R): D(4—3). Gornji trijas—lijas; Tršće—Crni Lazi; N, 20x.

2 Medium crystalline packed oodolomite; symbol 5PO(A):D(4). Upper Lias; Izlazak, Jablanica; N, 20x.

Srednjekristalasti oodolomit sa zbijenim alokemima; simbol 5PO(A):D(4). Gornji lijas; Izlazak, Jablanica; N, 20x.



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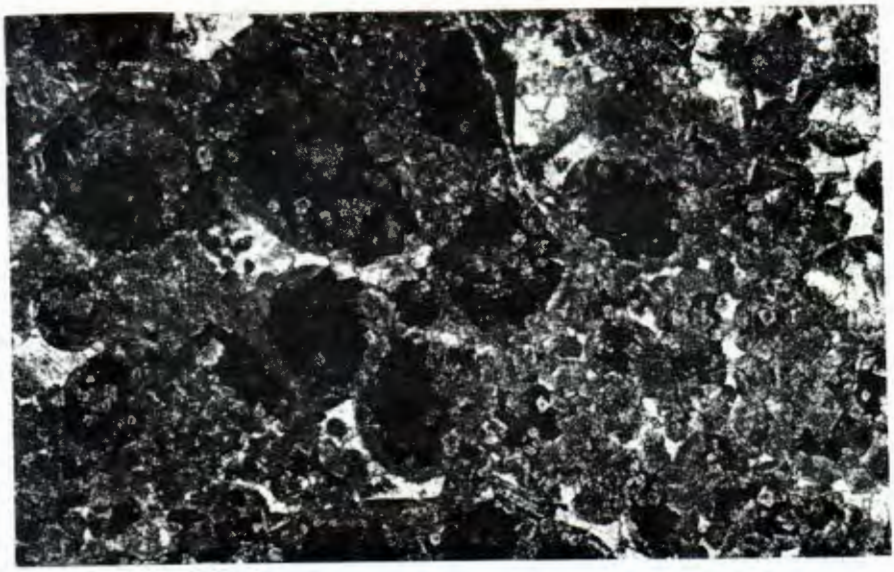

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PLATE — TABLA VII

1 Synbituminous (oily-pitchy, 0.08%) laminated finely crystalline dolomite; symbol SYNB (OPBA, VLC) LAM 5D (3); specimen. Lower Cretaceous; Vlaška; N, 40x.

Sinbituminozni (uljno-smolasti, 0.08%) laminirani sitnokristalasti dolomit, simbol SYNB (OPBA, VLC) LAM 5D (3); uzorak. Donja kreda, Vlaška; N, 40x.

2 Bituminous (low concentration) partially dolomitized laminated sparse biomicrite; symbol B (LC) PD LAM 2SB:LA, wackestone (w). Malm; Štikovo; N, 40x.

Bituminozni (niske koncentracije) djelomično doolmitizirani laminirani biomikrit sa razasutim alokemima; simbol B (LC) PD LAM 2SB:LA; wackestone (w). Malm, Štikovo; N, 40x.

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PLATE — TABLA VIII

1 Synbituminous (0.04%) slightly clayey fossiliferous micrite; symbol SYNB (VLC) TC 3B:LA; mudstone (M). Upper Permian; Brušane; +N, 40x.

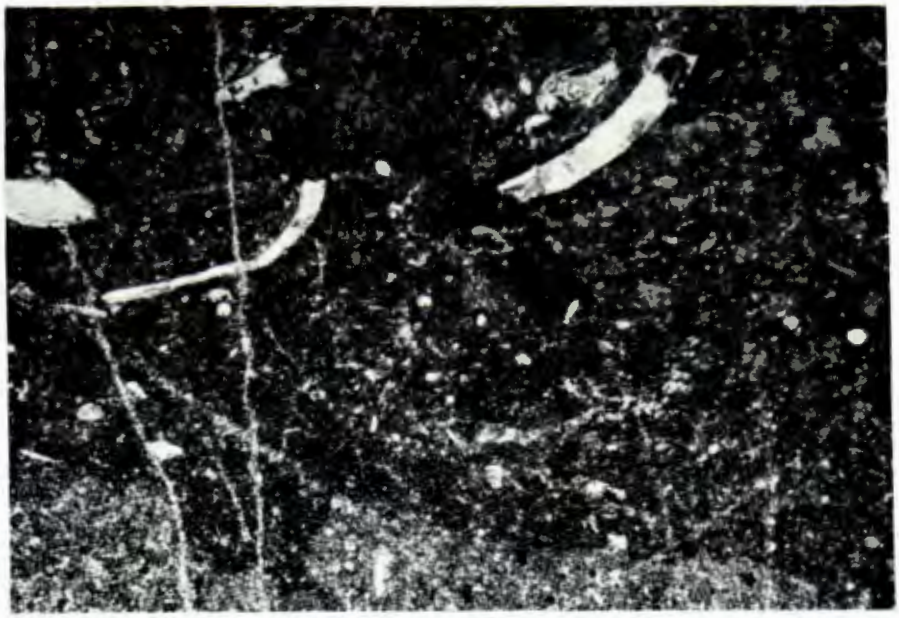
Sinbituminozni (0.04%) slabo glinoviti fosiliferni mikrit, simbol SYNB (VLC) TC 3B:LA; mudstone (M). Gornji perm, Brušane; +N, 40x.

2 Synbituminous (dotty, very low concentration, 0.02%), slightly clayey fossiliferous micrite; symbol SYNB (DT, VLC) STC 3B:LA, mudstone (M). Lias — Dogger; Avtovac; +N, 40x.

Sinbituminozni (točkasti, vrlo niske koncentracije — 0.02%) slabo glinoviti fosiliferni mikrit, simbol SYNB (DT, VLC) STC 3B:LA, mudstone (M). Lijas — doger, Avtovac; +N, 40x.

3 Synbituminous (oily-pitchy, 0.08%) laminated finely crystalline dolomite; symbol SYNB (OPBA, VLC) LAM 5D (3). — Lower Cretaceous; Vlaška; N, 40x.

Sinbituminozni (uljno-smolasti, 0.08%) laminirani sitnokristalasti dolomit, simbol SYNB (OPBA, VLC) LAM 5D (3). — Donja kreda, Vlaška; N, 40x.



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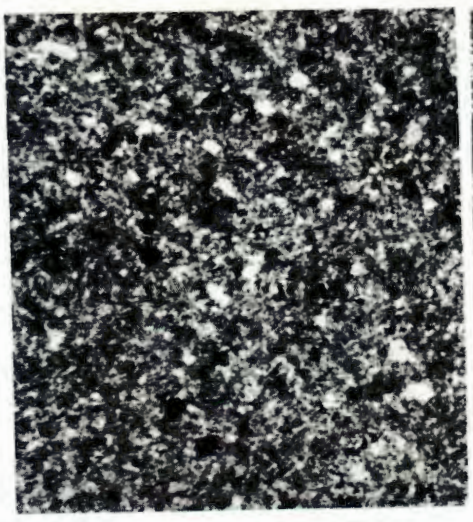

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PLATE — TABLA IX

1 Bituminous biointraclastic limestone; specimen.

Upper Cretaceous, Glušci near Metković.

Bituminozni biointraklastni vapnenac; uzorak. Gornja kreda, Glušci kod Metkovića.

2 Bituminous tectonic dolomite breccia. Senonian, Bašbuljuk near Ulcinj.

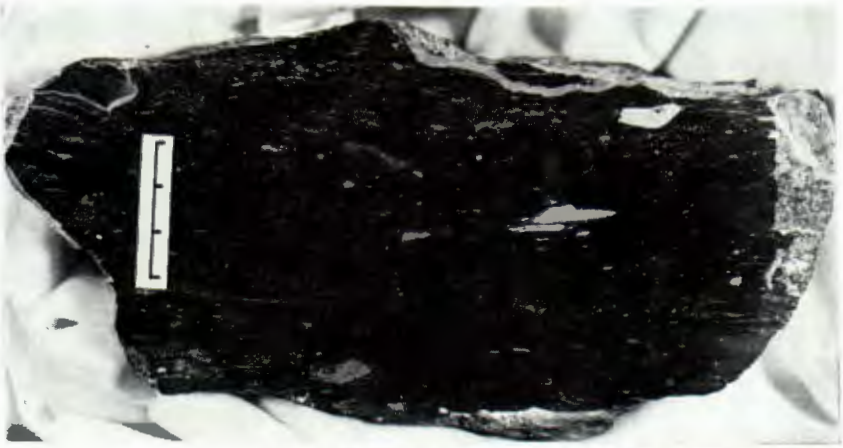
Bituminozna tektonska breča. Senon, Bašbuljuk kod Ulcinja.

3 Epibituminous (medium concentration, 6,46%) slightly sandy limestone (fossiliferous) tectonic breccia; symbol EPB (MC) STS (3B:LA) TC BR; treated with alizarine red — S. — Senonian; Mišetin Dolac near Donji Dolac; +N, 40x.

Epibituminozna (srednje koncentracije, 6,46%) slabo pjeskovita vapnenačka (fosiliferno-mikritska) tektonska breča, simbol EPB (MC) STS C (3B:LA) TC BR; bojeno s alizarinom red — S. — Senon; Mišetin Dolac kod Donjeg Dolca; +N, 40x.

4 Epibituminous (very low concentration, 0.07%) teleporic (fractured, 2.5%) partially (epigenetically) cemented (sparry) slighty recristallized (pseudomicrosparry) fossiliferous micrite; symbol EPB (VLC) TEP (FR, LP) P (EP) CEM(S) SR (PMS) 3B:LA. The bitumen occurs in fractures and calcite veins (lower part). Senonian; Okruglica near Donji Dolac; +N, 40x.

Epibituminozni (vrlo niske koncentracije, 0.07%), teleporni (pukotinski, 2.5%) djelomično (epigenetski) cementirani (sparni), slabo rekristalizirani (pseudomikrosparni) fosiliferni mikrit, simbol EPB (VLC) TEP (FR, LP) P (EP) CEM(S) SR (PMS) 3B:LA. Bitumen se nalazi u pukotinama i kalcitnim žilicama (dolje). — Senon; Okruglica kod Donjeg Dalca; +N, 40x.



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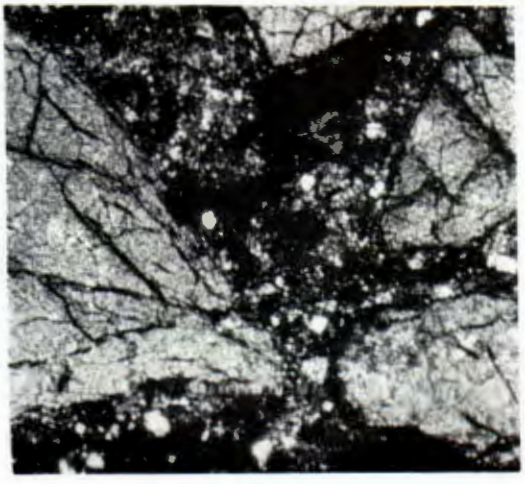


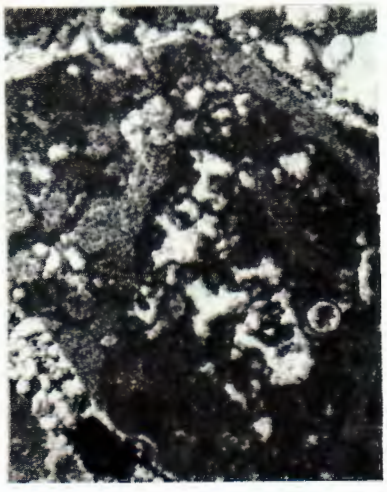


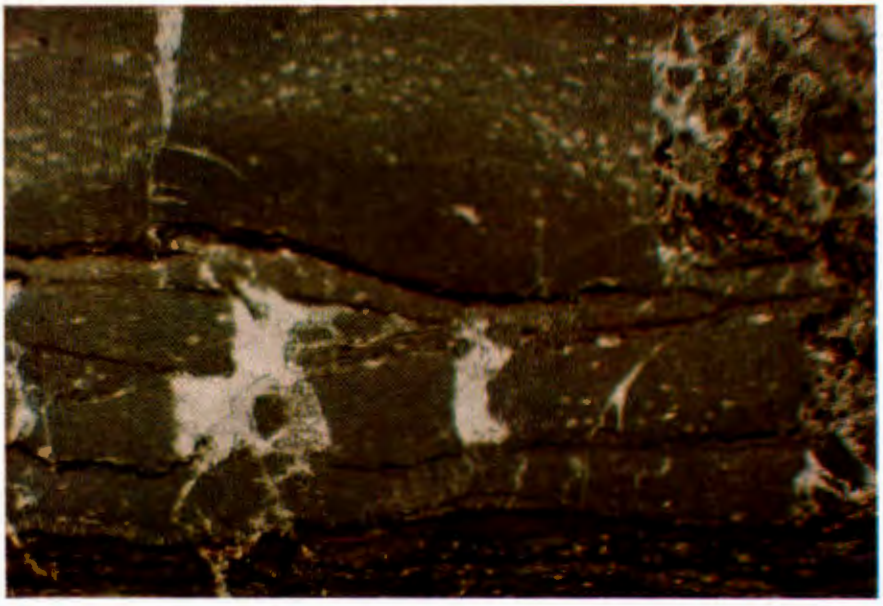
PLATE — TABLA X

1 Bituminous stromatolic limestone — biolithite (B). Partly crushed and cemented limestone. Thickness of stromatolitic laminae: ab 1 mm. Senonian, Mirca, the Island of Brač; N, 30x.

Bituminozni stromatolitni vapnenac-biolitit (B). Vapnenac je djelomično drobljen i cementiran. Debljina stromatolitnih lamina je oko 1 mm. Senon, Mirca, otok Brač; N, 30x.

2 Bitumen migration in fissures and calcite veinlets of laminated microcrystalline limestone — micrite (M). Upper Cretaceous, Kremena; N, 30x.

Migracija bitumena u pukotinama i kalcitnim žilicama u laminiranom mikrokristalastom vapnencu — mikritu (M). Gornja kreda, Kremena; N, 30x.



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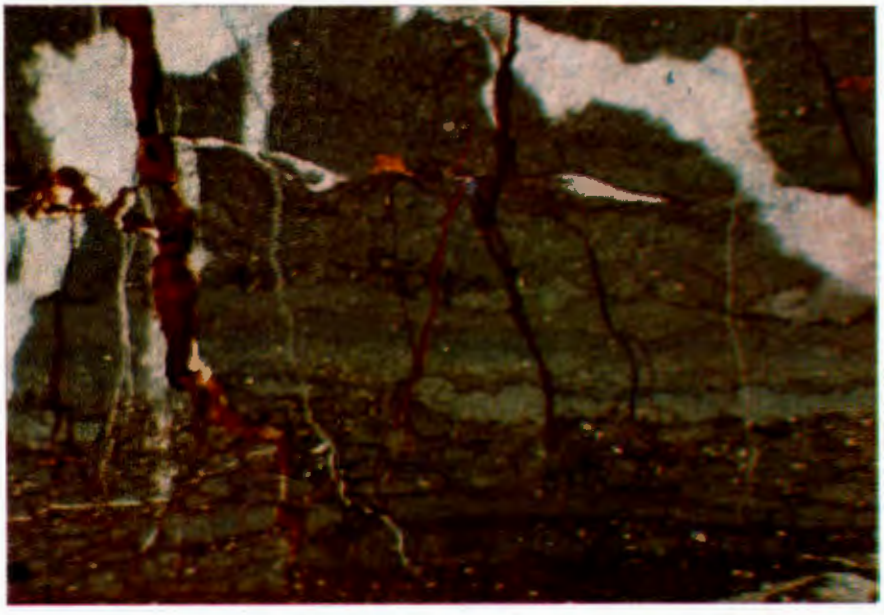

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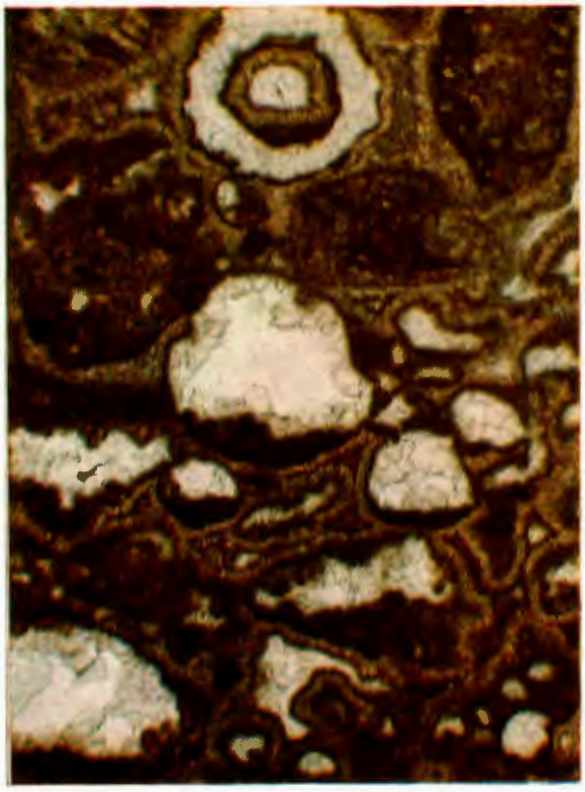
PLATE — TABLA XI

1 Synbituminous (0.04%) stromatolitic (or biohermal) dolomite-biolithodolomite; symbol SYNB (VLC) STL (or BH) D 5BL:D(3—4). Upper Permian, Brušane; N, 30x.

Sinbituminozni (0.04%) stromatolitni (ili biohermalni) dolomit-biolitodolomit; simbol SYNB (VLC) STL (ili BH) D 5BL:D(3—4). Gornji perm, Brušane; N, 30x.

2 Synbituminous (pitchy-asphaltic, 1.94%) laminated medium crystalline dolomite; symbol SYNB (PABA, LC) LAM 5D (4). Upper Cretaceous, Zasjede; N, 25x.

Sinbituminozni (smolasto-asfaltni, 1.94%) laminirani srednjokristalasti dolomit; simbol SYNB (PABA, LC) LAM 5D (4), Gornja kreda, Zasjede; N, 25x.



1

2

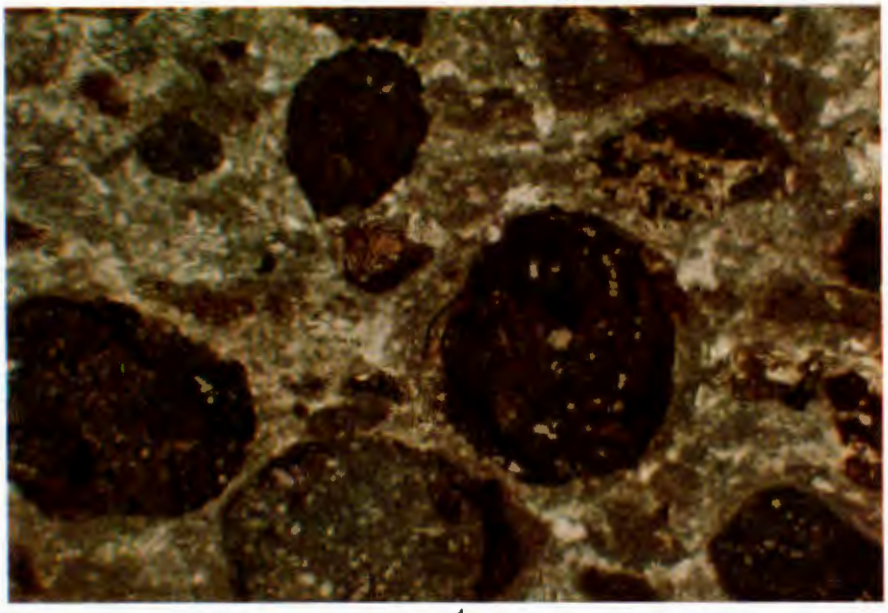
PLATE — TABLA XII

1 Bituminous intraformational microconglomerate. Upper Cretaceous, Milina Draga; N, 30x.

Bituminozni intraformacijski mikrokonglomerat. Gornja kreda, Milina Draga; N, 30x.

2 Bituminous laminated fine crystalline dolomite (C). Malm, Martinovići; N, 30x.

Bituminozni laminiranj sitnokristalasti dolomit (C). Malm, Martinovići; N, 30x.



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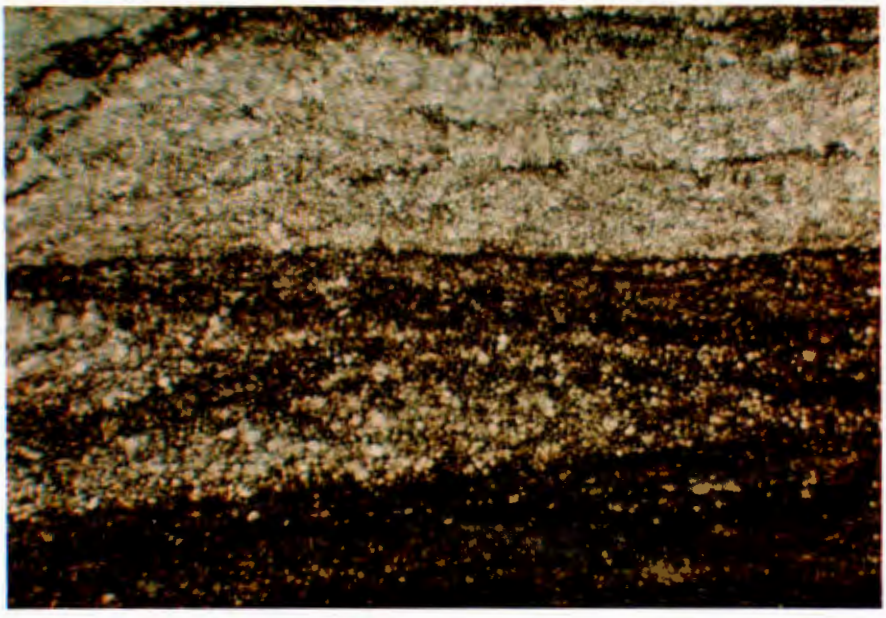


2

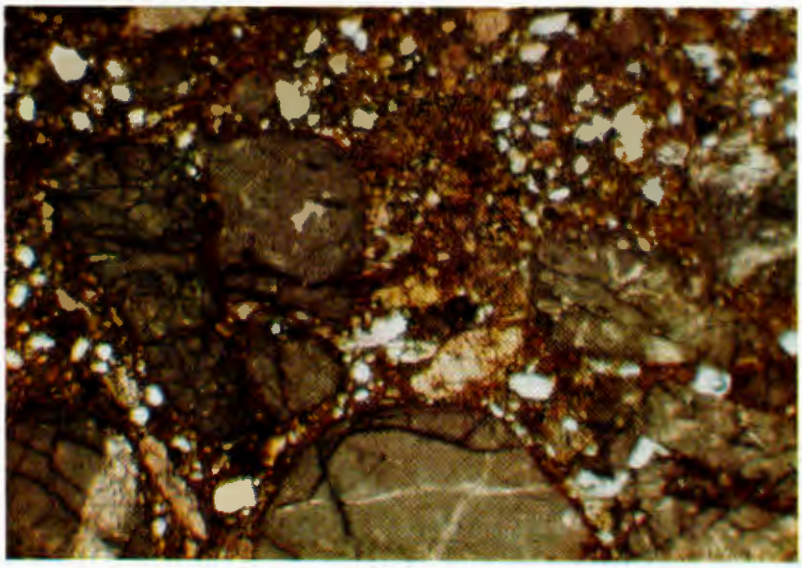
PLATE — TABLA XIII

1 Epibituminous (medium concentration) slightly sandy limestone (fossiliferous--biomicritic) intraformational conglomerate-breccia, viz. sparse intramicrudite; symbol EPB (MC) STS C (3B:LA — 2B:LA) CGL — BR; EPB (MC) STS 2SI:LR; treated with alizarine red — S. Senonian; Okruglica; N, 25x.

Epibituminozni (srednje koncentracije) slabo pjeskoviti vapnenački (fosiliferno--biomikritski) intraformacijski konglomerat — breča, tj. intramikrudit sa razasutim alokemima, simbol EPB (MC) STS C (3:B:LA) — 2B:LA) CGL — BR; EPB (MC) STS 2SI:LR. Bojen s alizarinom red — S. Senon, Okruglica; N, 25x.

2 Epibituminous (medium concentration — 7.32%) slightly sandy limestone (fossiliferous) tectonic breccia; symbol EPB (MC) STS C (3B:LA) TC BR; bituminization occurred after epigenetic calcite cementation; treated with alizarine red — S. Senonian; Bradarići; +N, 40x.

Epibituminozna (srednje koncentracije — 7.32%) slabo pjeskovita vapnenačka (fosiliferno-mikritska) tektonska breča, simbol EPB (MC) STS C (3B:LA) TC BR. Bituminizacija je usljedila nakon epigenetske kalcitne cementacije. Bojen s alizarinom red — S. Senon; Bradarići; +N, 40x.



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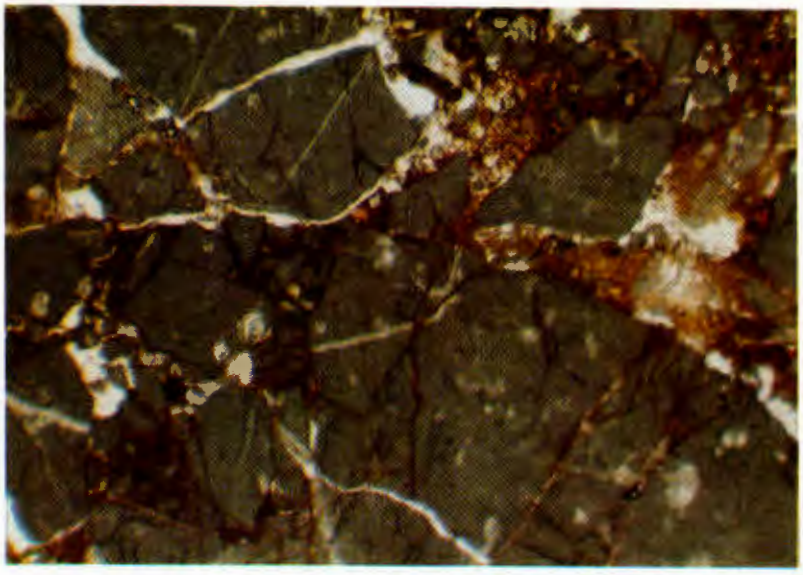


2

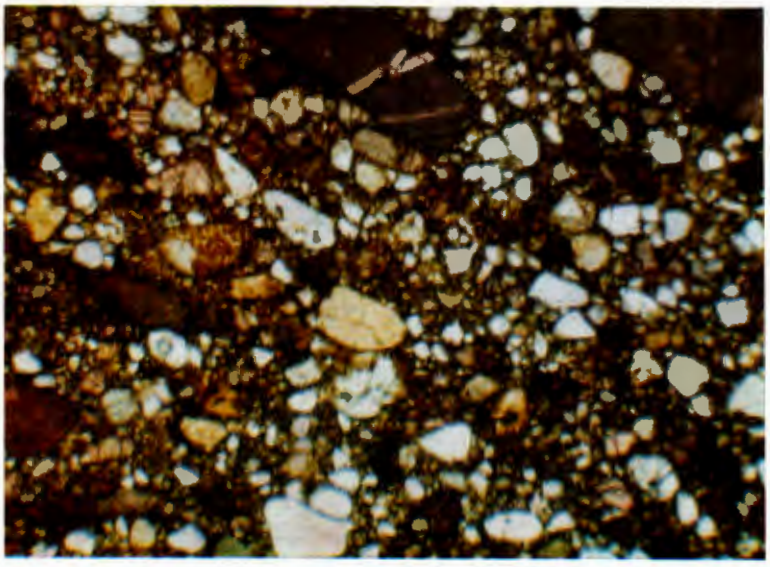
PLATE — TABLA XIV

1 Epibituminous (medium concentration) partially sandy sparse intramicrite, sandy wackestone; symbol EPB (MC) PTS 2SI:LA; (w) treated with alizarine red — S. Senonian; Okruglica; N, 25x.

Epibituminozni (srednje koncentracije) djelomično pjeskoviti intramikrit sa razasutim alokemima, pjeskoviti wackestone, simbol EPB (MC) PTS 2SI:LA, (w), bojen s alizarin red — S. Senon, Okruglica; N, 25x.

2 Epibituminous (3.92%) fractured biomicrudite — wackestone symbol EPB (LC) FR 2B:LR, LA — Ww. Senonian, Kreševo, near the Cetina River.

Epibituminozni (3,92%) drobljeni biomikrudit — wackestone simbol EPB (LC) FR 2B;LR, LA — Ww, Senon, Kreševo, kod rijeke Cetine.



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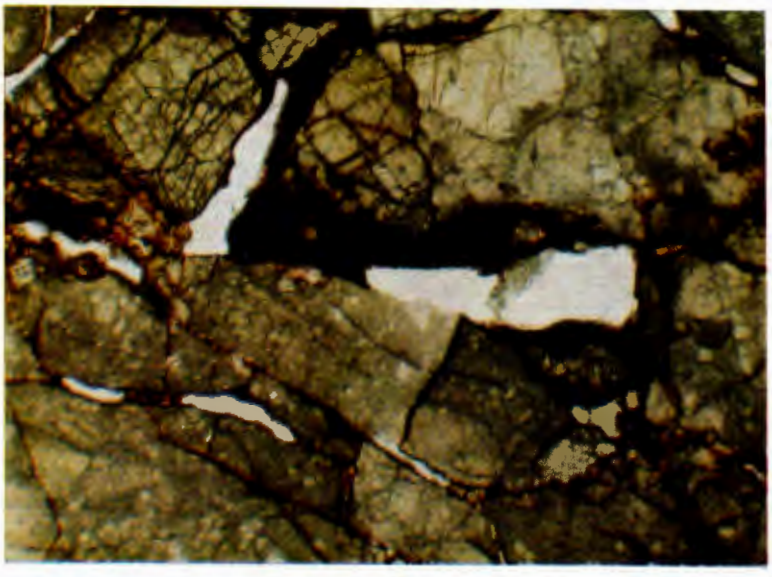

2

CLASSIFICATION OF RECRYSTALLIZED LIMESTONES
KLASIFIKACIJA REKRISTALIZIRANIH VAPNENACA

TABLE—*TABELA* II

Degree of recrystallization *Stupanj rekristalizacije*

<10% pseudosparry calcite or pseudomicrosparry calcite
<10% pseudospari ili pseudomikrospari kalcita

10—50% pseudosparry calcite or pseudomicrosparry calcite
10—50% pseudospari ili pseudomikrospari kalcita

>50% pseudosparry calcite or pseudomicrosparry calcite
>50% pseudospari ili pseudomikrospari kalcita

SLIGHTLY RECRYSTALLIZED PRIMARY LIMESTONES
SLABO REKRISTALIZIRANI PRIMARNI VAPNENCI

PARTIALLY RECRYSTALLIZED PRIMARY LIMESTONES
DJELOMICNO REKRISTALIZIRANI PRIMARNI VAPNENCI

HIGHLY RECRYSTALLIZED LIMESTONES, I. E. SECONDARY LIMESTONES
JAKO REKRISTALIZIRANI VAPNENCI, TJ. SEKUNDARNI VAPNENCI

type of allochems — *tip alokema*

oölites — *ooliti* intraclasts — *intraklasti*

pellets — *peleti* fossils — *fosili*

slightly recrystallized pseudosparry or pseudomicrosparry biolithomicrite PR (PS or PMS) 4:LM	— *slabo rekristalizirani pseudosparni ili pseudomikrosparni biolitomikrit PR (PS ili PMS) 4:LM*	slightly recrystallized pseudosparry or pseudomicrosparry intraclast-bearing micrite	*slabo rekristalizirani pseudosparni ili pseudomikrosparni intraklastični mikrit*	SR (PS or PMS) 3I : LR or LA	slightly recrystallized pseudosparry or pseudomicrosparry sparse intramicrudite	*slabo rekristalizirani pseudosparni ili pseudomikrosparni intramikrudit: sa razasutim alokemima*	SR (PS or PMS) 2SI : LR	slightly recrystallized pseudosparry or pseudomicrosparry packed intramicrudite	*slabo rekristalizirani pseudosparni ili pseudomikrosparni intramikrudit sa zbijenim alokemima*	SR (PS or PMS) 2PI : LR
slightly recrystallized pseudosparry or pseudomicrosparry biolithomicrite PR (PS or PMS) 3M:L	— *slabo rekristalizirani pseudosparni ili pseudomikrosparni biolitomikrit PR (PS ili PMS) 3M:L*						slightly recrystallized pseudosparry or pseudomicrosparry sparse intramicrite	*slabo rekristalizirani pseudosparni ili pseudomikrosparni intramikrit sa razasutim alokemima*	SR (PS or PMS) 2SI : LA	slightly recrystallized pseudosparry or pseudomicrosparry packed intramicrite	*slabo rekristalizirani pseudosparni ili pseudomikrosparni intramikrit sa zbijenim alokemima*	SR (PS or PMS) 2PI : LA
slightly recrystallized pseudosparry or pseudomicrosparry micrite	— *slabo rekristalizirani pseudosparni ili pseudomikrosparni mikrit SR (PS or PMS) 3 M : L*	slightly recrystallized pseudosparry or spseudomicrosparry oölite-bearing micrite	*slabo rekristalizirani pseudosparni ili pseudomikrosparni oolitični mikrit*	SR (PS or PMS) 3 O : LR or LA	slightly recrystallized pseudosparry or pseudomicrosparry sparse oömicrudite	*slabo rekristalizirani pseudosparni ili pseudomikrosparni oomikrudit sa rasutim alokemima*	SR (PS or PMS) 2 SO : LR	slightly recrystallized pseudosparry or pseudomicrosparry packed oömicrudite	*slabo rekristalizirani pseudosparni ili pseudomikrosparni oomikrudit sa zbijenim alokemima*	SR (PS or PMS) 2PO : LR
slightly recrystallized pseudosparry or pseudomicrosparry dismicrite	— *slabo rekristalizirani pseudosparni ili pseudomikrosparni dismikrit SR (PS od PMS) 3 MX : L*				slightly recrystallized pseudosparry or pseudomicrosparry sparse oömicrite	*slabo rekristalizirani pseudosparni ili pseudomikrosparni oomikrit sa razasutim alokemima*	slightly recrystallized pseudosparry or pseudomicrosparry packed oömicrite	*slabo rekristalizirani pseudosparni ili pseudomikrosparni oomikrit sa zbijenim alokemima*		
							SR (PS or PMS) 2 SO : LA			SR (PS or PMS) 2PO : LA
slightly recrystallized pseudosparry or pseudomicrosparry biolithomicrite PR (PS or PMS) 4:LM	*djelomično rekristalizirani pseudosparni ili pseudomikrosparni biolitomikrit PR (PS ili PMS) 4:LM*	partially recrystallized pseudosparry or pseudomicrosparry intraclast-bearing micrite	*djelomično rekristalizirani pseudosparni ili pseudomikrosparni intraklastični mikrit*	PR (PS or PMS) 3I : LR or LA	partially recrystallized pseudosparry or pseudomicrosparry sparse intramicrudite	*djelomično rekristalizirani pseudosparni ili pseudomikrosparni intramikrudit sa razasutim alokemima*	PR (PS or PMS) 2SI : LR	partially recrystallized pseudosparry or pseudomicrosparry packed intramicrudite	*djelomično rekristalizirani pseudosparni ili pseudomikrosparni intramikrudit sa zbijenim alokemima*	PR (PS or PMS) 2PI : LR
partially recrystallized pseudosparry or pseudomicrosparry biolithomicrite PR (PS or PMS) 3M:L	*djelomično rekristalizirani pseudosparni ili pseudomikrosparni biolitomikrit PR (PS ili PMS) 3M:L*						partially recrystallized pseudosparry or pseudomicrosparry sparse intramicrite	*djelomično rekristalizirani pseudosparni ili pseudomikrosparni intramikrit sa razasutim alokemima*	PR (PS or PMS) 2SI : LA	partially recrystallized pseudosparry or pseudomicrosparry packed intramicrite	*djelomično rekristalizirani pseudosparni ili pseudomikrosparni intramikrit sa zbijenim alokemima*	PR (PS or PMS) 2PI : LA
partially recrystallized pseudosparry or pseudomicrosparry micrite PR (PS or PMS) 3M:L	*djelomično rekristalizirani pseudosparni ili pseudomikrosparni mikrit PR (PS ili PMS) 3M:L*	partially recrystallized pseudosparry or pseudomicrosparry oölite-bearing micrite	*djelomično rekristalizirani pseudosparni ili pseudomikrosparni oolitični mikrit*	PR (PS or PMS) 3 O : LR or LA	partially recrystallized pseudosparry or pseudomicrosparry sparse oömicrudite	*djelomično rekristalizirani pseudosparni ili pseudomikrosparni oomikrudit sa razasutim alokemima*	PR (PS od PMS) 2SO : LA	partially recrystallized pseudosparry or pseudomicrosparry packed oömicrudite	*djelomično rekristalizirani pseudosparni ili pseudomikrosparni oomikrudit sa zbijenim alokemima*	PR (PS od PMS) 2PO : LR
partially recrystallized pseudosparry or pseudomicrosparry dismicrite PR (PS or PMS) 3MX:L	*djelomično rekristalizirani pseudosparni ili pseudomikrosparni dismikrit PR (PS ili PMS) 3MX:L*				partially recrystallized pseudosparry or pseudomicrosparry sparse oömicrite	*djelomično rekristalizirani pseudosparni ili pseudomikrosparni oomikrit sa razasutim alokemima*	partially recrystallized pseudosparry or pseudomicrosparry packed oömicrite	*djelomično rekristalizirani pseudosparni ili pseudomikrosparni oomikrit sa zbijenim alokemima*		
							PR (PS or PMS) 2SO : LA			PR (PS or PMS) 2PO : LA
biolithopseudosparit ili biolitopseudomikrosparit 4:LPS ili LPMS	*biolithopseudosparit ili biolitopseudomikrosparit PS ili PMS 3M:L*	slightly recrystallized pseudosparry or pseudomicrosparry fossiliferous micrite	*slabo rekristalizirani pseudosparni ili pseudomikrosparni fosiliferni mikrit*	SR (PS or PMS) 3 B:LR, LA or LL	slightly recrystallized pseudosparry or pseudomicrosparry sparse biomicrudite	*slabo rekristalizirani pseudosparni ili pseudomikrosparni biomikrudit sa razasutim alokemima*	SR (PS or PMS) 2SB : LR	slightly recrystallized pseudosparry or pseudomicrosparry packed biomicrudite	*slabo rekristalizirani pseudosparni ili pseudomikrosparni biomikrudit sa zbijenim alokemima*	SR (PS or PMS) 2PB : LR
pseudosparit ili pseudomikrosparit PS ili PMS 3M:L							slightly recrystallized pseudosparry or pseudomicrosparry sparse biomicrite	*slabo rekristalizirani pseudosparni ili pseudomikrosparni biomikrit sa razasutim alokemima*	SR (PS or PMS) 2SB : LA	slightly recrystallized pseudosparry or pseudomicrosparry packed biomicrite	*slabo rekristalizirani pseudosparni ili pseudomikrosparni biomikrit sa zbijenim alokemima*	SR (PS or PMS) 2PB : LA
dispseudosparit ili dispseudomikrosparit PS ili PMS 3MX:L												
biolithopseudosparite or biolithopseudomicrosparite 4:LPS or LPMS		partially recrystallized pseudosparry or pseudomicrosparry fossiliferous micrite	*djelomično rekristalizirani pseudosparni ili pseudomikrosparni fosiliferni mikrit*	PR (PS or PMS) 3 B : LR, LA or LL	partially recrystallized pseudosparry or pseudomicrosparry sparse biomicrudite	*djelomično rekristalizirani pseudosparni ili pseudomikrosparni biomikrudit sa razasutim alokemima*	PR (PS or PMS) 2SB:LR	partially recrystallized pseudosparry or pseudomicrosparry packed biomicrudite	*djelomično rekristalizirani pseudosparni ili pseudomikrosparni biomikrudit sa zbijenim alokemima*	PR (PS or PMS) 2PB : LR
pseudosparite or pseudomicrosparite PS or PMS 3M:L							partially recrystallized pseudosparry or pseudomicrosparry sparse biomicrite	*djelomično rekristalizirani pseudosparni ili pseudomikrosparni biomikrit sa razasutim alokemima*	PR (PS or PMS) 2SB : LA	partially recrystallized pseudosparry or pseudomicrosparry packed biomicrite	*djelomično rekristalizirani pseudosparni ili pseudomikrosparni biomikrit sa zbijenim alokemima*	PR (PS or PMS) 2PB : LA
dispseudosparite or dispseudomicrosparite PS or PMS 3MX:L												
		slightly recrystallized pseudosparry or pseudomicrosparry pelletiferous micrite	*slabo rekristalizirani pseudosparni ili pseudomikrosparni peletični mikrit*	SR (PS or PMS) 3P : LA	slightly recrystallized pseudosparry or pseudomicrosparry sparse pelmicrite	*slabo rekristalizirani pseudosparni ili pseudomikrosparni pelmikrit sa razasutim alokemima*	SR (PS or PMS) 2SP : LA	slightly recrystallized pesudosparry or pseudomicrosparry packed pelmicrite	*slabo rekristalizirani pseudosparni ili pseudomikrosparni pelmikrit sa zbijenim alokemima*	SR (PS or PMS) 2PP : LA
		partially recrystallized pseudosparry or pseudomicrosparry pelletiferous micrite	*djelomično rekristalizirani pseudosparni ili pseudomikrosparni peletični mikrit*	PR (PS or PMS) 3P : LA	partially recrystallized pseudosparry or pseudomicrosparry sparse pelmicrite	*djelomično rekristalizirani pseudosparni ili pseudomikrosparni pelmikrit sa razasutim alokemima*	PR (PS or PMS) 2SP : LA	partially recrystallized pseudosparry or pseudomicrosparry packed pelmicrite	*djelomično rekristalizirani pseudosparni ili pseudomikrosparni pelmikrit sa zbijenim alokemima*	PR (PS or PMS) 2PP : LA
		intraclast-bearing pseudosparite or intraclast-bearing pseudomicrosparite	*intraklastični pseudosparit ili intraklastični pseudomikrosparit*	PS or PMS 3 I : LR or LA	sparse intrapseudosparrudite or sparse intrapseudomicrosparrudite	*intrapseudosparrudit sa razasutim alokemima ili intrapseudomikrosparrudit sa razasutim alokemima*	S PS or PMS 1 I : LR	packed intrapseudosparrudite or packed intrapseudomicrosparrudite	*intrapseudosparrudit sa zbijenim alokemima ili intrapseudomikrosparrudit sa zbijenim alokemima*	P PS or P PMS 1 I : LR
							sparse intrapseudosparite or sparse intrapseudomicrosparite	*intrapseudosparit sa razasutim alokemima ili intrapseudomikrosparit sa razasutim alokemima*	S PS or S PMS 1 I : LA	packed intrapseudosparite or packed intrapseudomicrosparite	*intrapseudosparit sa zbijenim alokemima ili intrapseudomikrosparit sa zbijenim alokemima*	P PS or P PMS 1 I : LA
		oölite-bearing pseudosparite or oölite-bearing pseudomicrosparite	*oolitični pseudosparit ili oolitični pseudomikrosparit*	PS or PMS 3 O : LR or LA	sparse oöpseudosparrudite or sparse oöpseudomicrosparrudite	*oopseudosparrudit sa razasutim alokemima ili oopseudomikrosparrudit sa razasutim alokemima*	S PS or S PMS 1 O : LR	packed oöpseudosparrudite or packed oöpseudomicrosparrudite	*oopseudosparrudit sa zbijenim alokemima ili oopseudomikrosparrudit sa zbijenim alokemima*	P PS or P PMS 1 O : LR
							sparse oöpseudosparite or sparse oöpseudomicrosparite	*oopseudosparit sa razasutim alokemima ili oopseudomikrosparit sa razasutim alokemima*	S PS or S PMS 1 O : LA	packed oöpseudosparite or packed oöpseudomicrosparite	*oopseudosparit sa zbijenim alokemima ili oopseudomikrosparit sa zbijenim alokemima*	P PS or P PMS 1 O : LA
		fossiliferous pseudosparite or fossiliferous pseudomicrosparite	*fosiliferni pseudosparit ili fosiliferni pseudomikrosparit*	PS or PMS 3 B : LR, LA, or LL	sparse biopseudosparrudite or sparse biopseudomicrosparrudite	*biopseudosparrudit sa razasutim alokemima ili biopseudomikrosparrudit sa razasutim alokemima*	S PS or PMS 1 B : LR	packed biopseudosparrudite or packed biopseudomicrosparrudite	*biopseudosparrudit sa zbijenim alokemima ili biopseudomikrosparrudit sa zbijenim alokemima*	P PS or PMS 1 B : LR
							sparse biopseudosparite or sparse biopseudomicrosparite	*biopseudosparit sa razasutim alokemima ili biopseudomikrosparit sa razasutim alokemima*	S PS or S PMS 1 B : LA	packed biopseudosparite or packed biopseudomicrosparite	*biopseudosparit sa zbijenim alokemima ili biopseudomikrosparit sa zbijenim alokemima*	P PS or P PMS 1 B : LA
		pelletiferous pseudosparite or pelletiferous pseudomicrosparite	*peletični pseudosparit ili peletični pseudomikrosparit*	PS or PMS 3 P : LA	sparse pelpseudosparite or sparse pelpseudomicrosparite	*pelpseudosparit sa razasutim alokemima ili pelpseudomikrosparit sa razasutim alokemima*	S PS or S PMS 1 P : LA	packed pelpseudosparite or packed pelpseudomicrosparite	*pelpseudosparit za zbijenim alokemima ili pelpseudomikrosparit sa zbijenim alokemima*	P PS or P PMS 1 P : LA
allochems *alokema*	0	0—1	1—10		10—50		> 50			