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Aragonite sediments: nomenclature and classification

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Резюме. За първи път на територията на Североизточна и Северозападна България са доказани сарматски арагонитни седименти. Запазването на неконсолидирани седименти, изградени преимуществено от минерала арагонит, е едно изключително рядко явление. По тази причина, както в българската, така и в световната геоложка литература, няма номенклатурен термин за обозначаването им и съответно адекватна схема, по която могат да бъдат класифицирани установените арагонитни седименти. Необходимостта от създаването на нова класификация възникна при опита да бъдат корелирани арагонитните седименти от Североизточна и Северозападна България. В настоящата статия седиментите със съдържание на арагонит над 50% са наречени арагонитити. Предлага се класифицирането на арагонититите да става на базата на четири основни параметъра: 1 — минерален състав; 2 — количество и вид на примесите; 3 — структура и 4 — текстура. В зависимост от минералния състав и количеството на преобладаващите примеси са отделени два основни типа арагонитни седименти — чисти арагонитити (със съдържание на арагонит над 80%) и глинести арагонитити (със съдържание на арагонит от 50 до 80% и респективно глинести минерали — от 20 до 50%). Арагонитните седименти се отличават с микрокристална структура и масивна и ламинарна текстура.

Key words: aragonite sediments, nomenclature, classification, Sarmatian, Northeastern and Northwestern Bulgaria

Introduction

The detailed sedimentological investigations of the Sarmatian unconsolidated aragonite sediments from the Neogene sections (boreholes and outcrops) of the Northeastern and Northwestern Bulgaria (Koleva-Rekalova, 1992; 1998) reveal that they have a relatively vast distribution and comparatively high thickness, in some places up to 90.0 m (Koleva-Rekalova, 1994). These sediments are discovered for the first time at the territory of Bulgaria and respectively in the Bulgarian geological literature there is not an adequate nomenclature term for their designation. That rule applies to the foreign geological literature where only recent aragonite muds and ancient micrite limestones, which are diagenetically formed from them, are described. It is well know that the aragonite is an unstable mineral and it easily inverts to low-magnesian calcite under appropriate conditions and for comparatively short geological time period. Because of this special feature of the aragonite sediments they cannot been preserved in the geological record in the most of the cases. By the same reason, as mentioned above, any schemes about classification of the sediments in which the aragonite is main rock forming mineral do not exist in our and world literatures. The necessity of creating of such classification came when was made an attempt to correlate the aragonite sediments from Northeastern and Northwestern Bulgaria.

Nomenclature

In Bulgarian geological literature exist some examples for introduction of special names of more particular rocks. For instance Aleksiev and Djourova (1974) called zeolitites the rocks containing above 50 per cent zeolite minerals and Начев (1988) accepted as glauconitites the sedimentary rocks with a content of glauconite above 50 per cent, too. Adhering to the nomenclature tradition, used for the designation of rocks, it can be suggested that the sediments containing aragonite more than 50 per cent to be called aragonitites.

Classification

Four main parameters for classification of the aragonitites are proposed in the present study: 1 — mineral composition; 2 — percentage amount of the admixtures; 3 — texture and 4 — structural peculiarities. These parameters, obtained on the base of detailed field observations and significant numbers of laboratory analyses, are the most informative about the present classification.

The mineral composition is the determinant parameter in the classification of the aragonite sediments. As mentioned, the aragonitites are those rocks that contain more than 50 per cent aragonite. The numerous primary investigations show that the clay minerals are the most important and com-

paratively constant admixture into aragonite sediments. This is the main reason the clay minerals to be accepted as a second component in the classification. Both terrigenous (as quartz, feldspars, etc.) and biogenic (especially diatoms and silicisponge spicules) components are in an insignificant and strongly varying total quantity (from 0 to 10 per cent) and they can be eliminated as classifiable marks.

The subdivision of the aragonitites according to the percentage amounts of main admixtures can be various, depending on which limestone classification is used in the studied area. The limestone interbeds between the aragonite sediments are classified by the scheme of Чаталов (1971), thus some boundary percentages for the admixture amounts are take into account from it, with insignificant modifications. In the cases when the clay minerals are from 20 to 50 per cent, the sediments are detached as clayey aragonitites. Their colour is greenish because of the presence of clay minerals. In the classification of Чаталов (1971), as in the more well-known classifications (Султанов, 1980), that percentage composition corresponds to the realm of the marls. However, the genesis of the aragonite muds (Koleva-Rekalova, 1994) is different from that of classical marls where the low-magnesian calcite is the main carbonate mineral. Consequently, the term clayey aragonitites is more informative and has a genetic sense. When noncarbonate (chiefly clayey) constituents are from 0 to 20 per cent the aragonitites are pure ones. This subdivision is different from the classification of Чаталов (1971) and from others classifications, where as pure limestones are accepted the rocks with total carbonate amount more than 90 or 95 per cent. But the numerous carbonate analyses of the aragonite sediments show that maximum amount of the aragonite varies from 80 to 92 per cent. In this case the use of the boundary 90 or 95 per cent for a separation of the pure aragonite sediments is unacceptable and can be eliminated. The pure aragonitites are white to yellowish in colour.

In general the texture of the aragonite sediments can be accepted as microcrystalline by the following reasons. From 30 to 60 per cent of the aragonite crystals have sizes under 0.004 mm and the others are with sizes from 0.004 to 0.010-0.012 mm, rarely up to 0.016 mm (data are obtained by investigations of the smear thin sections). A correct pipette analysis (conventional way of measuring particle size on the basis of Stokes' law) of the aragonitites cannot be made because the aragonite crystals are strongly elongated in a direction (with prismatic and needle shapes) and the aragonite density is higher than those of the quartz.

The aragonite sediments possess mainly massive and laminar structures (proved with field observations). When the thicker beds show no visible internal lamination, the aragonitites are massive. By contrast, the laminate sediments are composed of large numbers of distinct laminae with thickness of tens of a millimetre to 1-2 mm.

Conclusions

The present study is the first attempt to be made a classification of the ancient aragonite sediments (named aragonitites) according to some parameters. Two main types are detached — pure and clayey aragonitites. The accepted simplified scheme for the classification of these sediments is easy and convenient, especially in the cases of the field observations and correlation.

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