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CONTRIBUTIONS TO THE MORPHOMETRIC AND MORPHOSCOPIC STUDY OF BADENIAN SANDS FROM MIORCANI AREA

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Abstract

This study concerns the quartzoase sands of "detritic formation", from the base of the lost sedimentation cycle in this area of Moldavian Platform.

Based on grain – size and morphoscopic analyses we determined some grain – size distribution parameters (sorting, standard deviation, graphic skewness), and we reconstructed the sedimentation environments.

The morphoscopic analysis revealed that the sand grains were worked in different sedimentary environment such as: fluvial, deltaic and tidal.

Key words: Morphology and morphoscopy of Badenian quartzous arenites from Moldavian Platform.

The quartzous sands from Miorcani area were remarked by the geologists since the last century. Among the researchers who studied these sands we mention: I. Simionescu (1902), I. Atanasiu and N. Macarovici (1950), Al. Chelărescu (1961), Gh. Bâgu (1963), L. Ionesi and B. Ionesi (1981), Gh. Bâgu and Al. Mocanu (1984), Roamanian Geological Institute (1998).

Considering their age, these quartzous sands belong to the detrital formation (infra-anhydritic), which marks the Badenian transgression from North-East of Moldavian

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Platform, the Badenian age being proved by the presence of exemplars such of: *Glycimeris deshayesi*, *Chlamys* sp., *Ostrea digytalina*, *Ostrea lamellosa*.

Mineralogical content

The mineralogical structure of the quartzous sands was determined on petrographical slides (with dental cement). The very fine fractions, the lithic fragments and the organic rests (shells and vegetal material) were not considered. This content is shown in Table I (after MINDO SA).

Table I. Mineralogical content of Miorcani Sands

MINERAL	CONTENT *(%)			
	Coarse sand	Pre-sized sand	Class C_0	Special class C_0
Quartz	84.5-89.9	88.2-92.1	94.2-97.9	95.1-97.9
Calcite	1.3-2.8	0.5-1.2	1.4-1.7	1.1-1.2
Feldspars	1.1-2.2	0.5-1.2	-	-
Glauconite	Sub 0.5	-	-	-
Turmaline	0.9-1.1	0.5-1.2	0.6-0.8	-
Apatite	1.1-1.3	0.5-0.8	-	-
Epidote	0.4-1.1	0.5-1.2	-	-
Granate	0.5-1.7	0.9-1.2	< 0.8	< 1.2
Titanite	0.4-0.6	0.4-0.8	< 0.8	< 1.0
Cyanite	1.6-1.8	1.2-1.4	< 0.8	-
Staurolite	1.1-1.3	0.4-0.9	-	< 1.2
Hornfels	sub 0.5	-	-	-
Zircon	0.4-0.6	0.5-0.8	< 0.8	< 1.2
Rutile	0.4-1.1	0.5-0.8	-	-
Goethite	0.4-0.6	0.5-0.8	-	-
Ilmenite	0.4-0.6	0.5-0.8	-	-
Pyrite	< 0.5	-	-	-

Correlating and interpreting the mentioned data, along with the chemical analysis from other authors, we appreciated the following mineralogical composition for these sands:

Table II. Mineralogical content of Miorcani Sands

MINERAL	CONTENT (%)			
	Coarse sand	**Presized preclasat**	**Class C_0**	**Special class C_0**
Quartz	about 90	about 96.50	about 97.25	about 97
Calcite	5.40-6.60	2.30-3.10	2.00-2.15	about 2.20
Feldspars	about 0.50			
Heavy minerals (zircone,rutile, apatite, staurolite,cyanite,granates, turmaline,hornblende, epidote,titanite etc).	about 0.50	about 0.50	0.20-0.50	0.50-0.70
Metallic minerals (ilmenite,magnetite, hematite,pyrite,pyrotine)	< 0.10	< 0.10	< 0.10	< 0.10
Argillaceous minerals	about 2.50	+	-	-
Lithic fragments Shell fragments	+	+	+	+
Woody organic matter	+	-	-	-

Morphometry

The granoclastic analysis of Miorcani Sands showed the followig characteristics:

Grading class	Mass share %
	Coarse sand
> 0.50	1.7
0.50 - 0.40	5.1
0.40 - 0.30	6.4
0.30 - 0.25	5.7
0.25 - 0.20	33.9
0.20 - 0.15	22.2
0.15 - 0.10	9.1
0.10 - 0.04	10.2
< 0.04	5.7
Total	100

Based on the granometric analysis, the following graphics resulted:

a) Histogram:

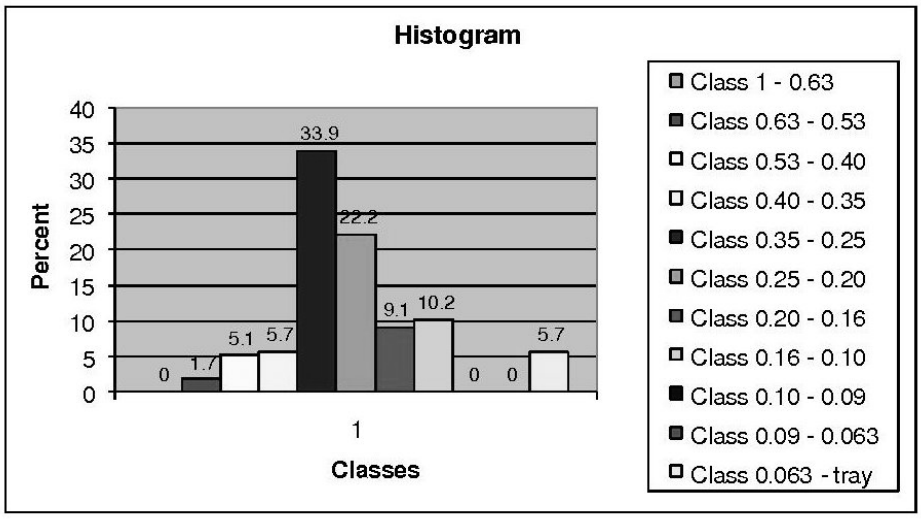

Fig. 1. Histogram of Miorcani quartzous Sand

b) Frequency curve

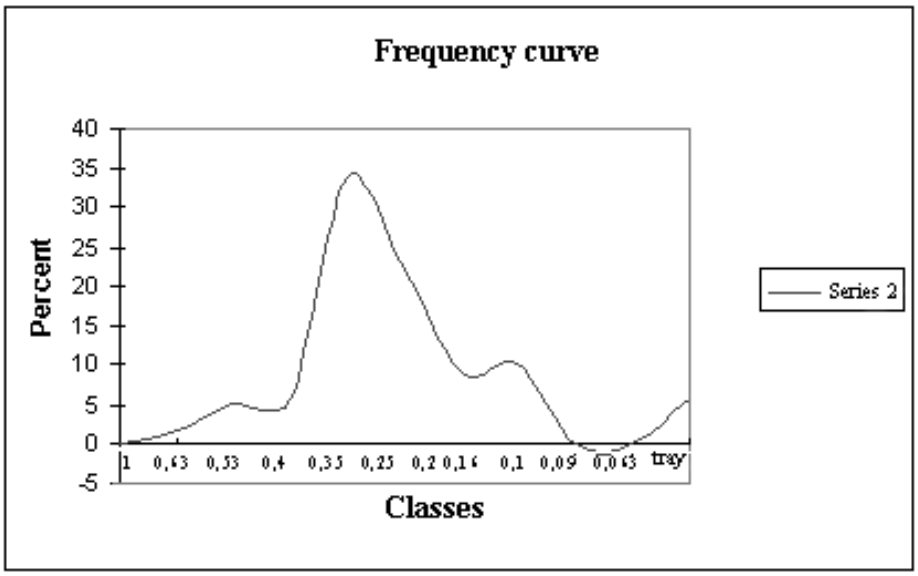

Fig. 2. Frequency curve of Miorcani quartzous Sands.

c) Cumulative curve – see Annex 1.

The analysis of the grain form and the establishing of the measurement characteristics allowed the separation of the morphometric categories and the establishing of the morphometric parameters.

Table IV. Morphometric categories of sand grains

Grain categorie	Miorcani Frequency %
angular Ro = 0.125 – 0.250 Aφ = 3.00 – 2.00	Class 1.00 – 0.50mm 40 45 8
subangular Ro = 0.260 – 0.330 Aφ = 1.90 – 1.60	Class 0.50 – 0.25mm 5 12 67

subrounded Ro = 0.335 – 0.465 Aφ = 1.50 – 1.10	Class 0.25 – 0.125mm 1 4 69
rounded Ro = 0.500 – 0.660 Aφ = 1.00 – 0.60	Class 0.125 – 0.063mm 3 6 68
very rounded Ro = 0.700 – 1.00 Aφ = 0.50 – 1.00	Class < 0.063mm 8 24 55

The morphoscopic characteristics of the grains are also shown in Table V.

Table V. Morphoscopic characteristics of sand grains from NHB sample (after R.S. Crofts, 1974) (after SC. MINDO SA. Data).

						very angular
						Angular
						Subangular
•	•••	••	••			Subrounded
•		••	•••			Rounded
		••	•			Very rounded
very spherical	spherical	Sub-spherical	Sub-edged	Edged	Very edged	

Considering the morphometric analysis, we established the statistical coefficients of Miorcani Sands:

Table VI. Statistical coefficients of Miorcani Sands

	Sample	Trask (1942)	Inman (1952)	Folk and Ward
Median	1	0.20	2.4	2.4
	2	0.21	2.3	2.3
	3	0.20	2.5	2.5
Average	1	0.20	2.3	2.3
	2	0.21	2.35	2.3
	3	0.19	2.5	2.5
Sorting coefficient	1	1.16	0.6	0.75
	2	1.27	0.25	0.43
	3	1.22	0.4	0.54
Asymmetry coefficient	1	0.94	-0.16	0.15
	2	1.03	0.2	-0.13
	3	0.99	0.0	0.16
Angulosity coefficient (Kurtosis)	1	0.16	1.15	1.36
	2	0.29	3.2	3.5
	3	0.30	3.0	1.88

Morphoscopy

The geological processes, which activate within the sedimentary domain, mark the textural characteristics of the detrital deposits. The morphological characteristics of grains, besides the morphometric ones, represent the reconstructing criteria of the sedimentation parameters.

The morphology of the surfaces gets clear significations for the detrital grains reworked in the fluvial and deserting areas (after N. Anastasiu and D. Jipa – 1983).

The exoscopic analysis on Miorcani Sand grains allowed the identification of some physical and chemical depositions on the surface of these grains.

The initial forms of the grains of torrential origin present angles and rounded edges and smooth surfaces with clear traces probably gained during the eolian transport in the littoral dune area (Plate II).

Some grains have fresh, large cracks, which modify their form and measurements, as result of the evolution in aquatic environments with increased energy in the intertidal zone. On the grain surface there are carbonatic crusts and depositions of different forms and sizes. These ones and the various forms of dissolutions from the surfaces show that the last environment in the grain evolution was an infratidal environment, oversaturated in SiO_2 and $CaCO_3$. The depositions of amorphous silica, incompletely dissolved, probably deltaic, fixed in large cracks with negative relief can be noticed.

In the desert continental (eolian) domain, the grains were transported by wind and have a specific reworked aspect.

On some grains there are morphoscopic elements as „V" or „semilunar" cavities, as result of the impact of the grains of different densities or dimensions (Plate II – Figure 5).

Considering the final data, it figures out the evolution of the grains in the respective palaeoenvironments:

Torrential environment → short time depositions in deltaic environment → eolian reworking within littoral dunes → tidal environment reworking by violent movement followed by remodeling of the dimensions and form → fixed evolution within the tidal environment with small depth and with a CaCO3 oversaturated siliceous sublayer.

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