INVESTIGATION OF QUARTZ-KAOLINITE STIFF CLAY FROM THE KARA MIHAL DEPOSIT (NORTH-EASTERN BULGARIA) AS POTENTIAL RAW MATERIAL FOR THE PRODUCTION OF FLOOR TILES

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1. INTRODUCTION

The recently discovered Kara Mihal deposit is located in North-eastern Bulgaria, 1.5 km away from the village of the Kara Mihal, Razgrad district. The geological position, chemical composition, mineral composition, as well as the main physical-mechanical properties of the explored clayey-sandy raw materials, were determined.

2. EXPERIMENTAL

The geological setting of the Kara Mihal deposit was studied by geological mapping, trenches and drill holes. The sampling plan was carried out according to the penetrated lithological bodies. The chemical composition was determined by AESICP analyses, the mineral composition being determined through XRD analysis by DRON-3M Russia. The physical-mechanical properties of the investigated raw material were studied using standard methods for ceramic materials.

In the regional tectonic framework of Bulgaria, the Kara Mihal deposit is situated in the Moesion platform tectonic unit. The basement of the clayey raw material is represented by karstified Lower Cretaceous carbonate rocks belonging to the Razgrad Formation and the Rousse Formation. The carbonate rocks are covered by multiple types of Quaternary deposits part of which is the Kara Mihal quartz-kaolinite clay. In the Kara Mihal deposit Quaternary sediments are subdivided in three types according to their origin: alluvial, aeolian and dilulvial. Similarly to the Zdravets deposit [1] (located 7 km northeast of the Kara Mihal deposit) the studied clayey raw material were formed in alluvial depositional environments during the Early and Middle Pleistocene and could be related to the sandy-kaolinite formation and overlaying red-brownish clayey sediments [2]. The stratigraphic section of the Pleistocene in Kara Mihal deposit can be subdivided into three lithological packages: basal carbonate conglomerate with red and yellow clayey matrix; lenticular-layered and layered sandy-kaolinite sediments (producing level with thickness up to 15.7 m) and overlaying loess sediments (Figs. 1 and 2).

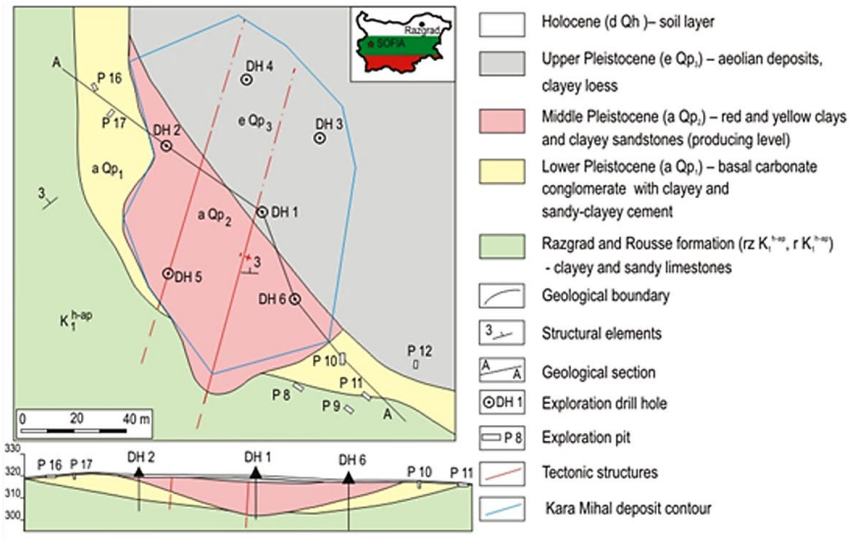

Fig. 1. Geological map of the Kara Mihal deposit

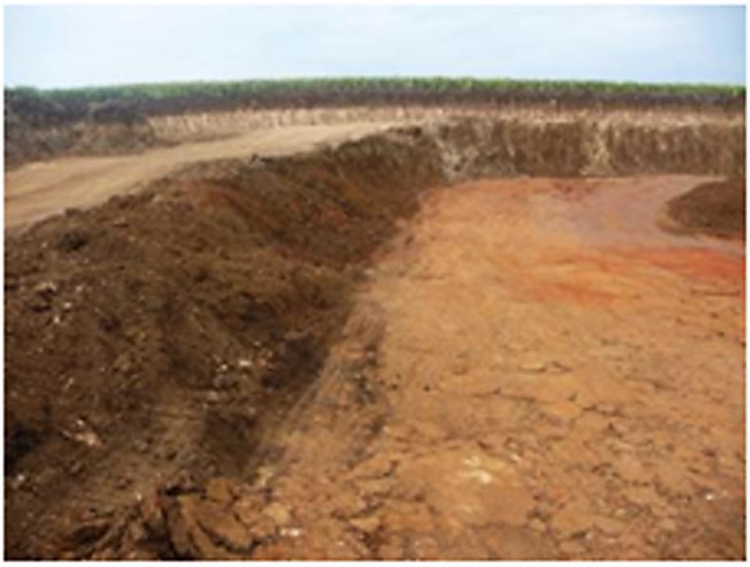

Fig. 2. A general view of the Kara Mihal deposit

3. RESULTS AND DISCUSSION

According to the mineral composition clay "Kara Mihal" is a quartz-kaolinite type (Fig. 3). On the basis of the chemical composition the clay is semi-acid with high content of colouring oxides (Table 1) .

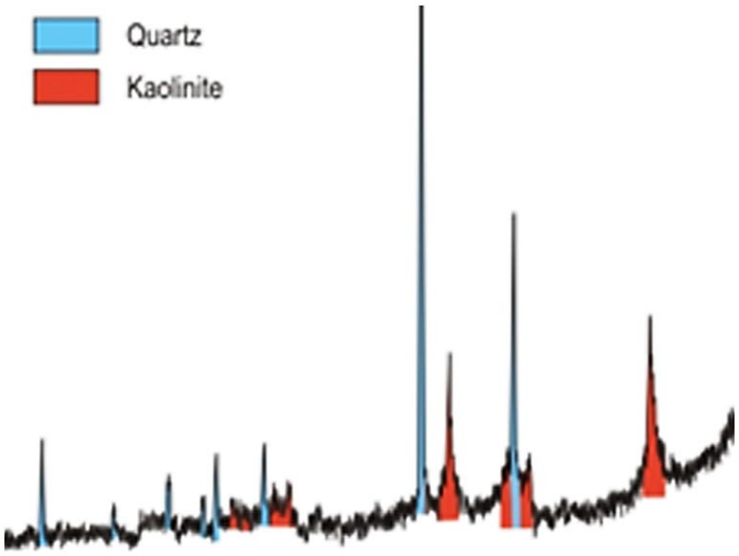

Fig. 3. Mineral composition of the Kara Mihal clay

SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	MnO	Na_2O	K_2O	TiO_2	P.p.c.
60,44	19,56	7,70	1,37	0,53	0,12	0,14	0,58	0,68	8,86

Table 1. Chemical composition of the "Kara Mihal" clay / mass-%

According to the physical-mechanical properties (Table 2), the "Kara Mihal" clay is appropriate for the production of floor tiles.

Properties	Values
Absolute moisture, %	30.0-32.0
Relative moisture, %	23.0-25.0
Plasticity, %	25.0-27.0
Air shrinkage, %	6.0-7.0
Green mechanical bending strength, MPa	2.0-3.5
Total shrinkage, 1050°C, % 1150°C, %	11.0-13.0 14.0-15.0
Mechanical bending strength, 1050°C, MPa 1150°C, MPa	 7.0-8.0 8.0-10.0
Water absorption, 1050°C, %	12.0-14.0

Table 2. Physical-mechanical properties of the clay "Kara Mihal"

Production testing was performed in Khan Asparuh JSC in the town of Isperih. The Kara Mihal material was introduced into ceramic bodies for floor tiles at various quantities between. It was established that the incorporation of quantities of 7 to 15% of the studied raw material in the ceramic bodies for single firing floor tiles production was appropriate and the products met the standards.

The raw material has been included in the production cycle. The Kara Mihal deposit is currently being produced.

REFERENCES

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