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RESEARCH OF THE CHEMICAL AND MINERALOGICAL PROPERTIES OF THE LIMESTONE OF THE ZHAMANSAI DEPOSIT OF THE REPUBLIC OF KARAKALPAKSTAN - AS A RAW MATERIAL FOR THE PRODUCTION OF PORTLAND CEMENT CLINKER

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ABSTRACT--- *This paper makes analyses of the research of the chemical and mineralogical properties of the limestone of the Zhamansai deposit of the Republic of Karakalpakstan. On this case, as a raw material for the production of portland cement clinker was analysed in the research area of the region. Finally, research has done analyses on the various points while showing both outcomes and shortcomings as the whole.*

Keywords--- *Research, chemical, mineralogical properties, limestone of the zhamansai, Republic of Karakalpakstan, raw material, production of portland, cement clinker*

I. INTRODUCTION

To carry out research work, the limestones of the Dzhamansaysky deposit were used as starting materials. The Dzhamansay deposit is confined to the southern spurs of the central part of Sultanuizdag and is limited from the west by the Dzhamansay tract, from the east - Kazansay.

Administratively located on the territory of the Beruni district of the Republic of Karakalpakstan, 90 km southeast of the city of Nukus and 40 km north of the district center of Beruni [1].

The main factor determining their suitability for use in the production of Portland cement clinker is the chemical composition.

According to chemical analyzes, the limestones of the productive stratum of the deposit are high-carbonate type of raw materials. The CaO content is in the range (50.4-56.16)% with a prevailing value (53.5-55.5)%. Single low CaO contents for samples, when averaged over production and production ledge, do not reduce the quality of raw materials. The average content of this oxide in limestones by mine is (53.75-55.47)%, by exploration lines - (54.59-54.95)%, and by the deposit as a whole - 54.79%.

The content of other oxides in the limestones of the deposit varies slightly and does not exceed the requirements for this type.

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II. RESULT

According to the radiation and hygienic assessment carried out during exploration, the limestones of the deposit according to NRB - 76 belong to class I and can be used for the production of building materials without limiting their scope [2].

Currently, TITAN CEMENT LLC JV is guaranteed a land plot on the territory of the Dzhamansaysky limestone deposit [83, 84].

In order to provide the cement plant with raw materials in the Karauzyak district, the enterprise of TITAN CEMENT LLC JV, reserves of block VI-C1 of the Dzhamansaysky limestone deposit in the amount of 4467.194 thousand tons are requested [3].

The limestone deposit is located on the territory of the Beruniy district of the Republic of Karakalpakstan, 25 km east of the village of Karatau, 8 km north-east of the village of Aktau and 9 km north-east of the settlement village “81km”.

Chemical (Table 1), X-ray phase (Fig. 1.), Thermogravimetric (Fig. 2.), Petrographic (Fig. 2.) Analyzes were carried out.

Table 1: The chemical composition of technological samples of limestone of the Dzhamansaysky deposit, (in terms of 100%)

	Name of samples	**p.p.p**	**SiO_2**	**$A1_2O_3$**	**Fe_2O_3**	**CaO**	**MgO**	**SO_3**	**R_2O**	**P_2O_5**	**TiO_2**
	Limestone of the Dzhamansay-2 deposit	0,33	,59	,16	,21	0,53	,18	,25	,54	,05	,16
	Limestone of the Dzhamansay-2 deposit	2,39	,28	,99	л.	1,61	,70	,03			

Taking into account that the cement factory needs to produce 234.0 thousand tons of clinker per year at the cement plant, the annual supply of carbonate component (75% limestone) to the factory’s ex-warehouse should be 175.5 thousand tons or 66.985 thousand .m3 in a dense body (bulk density - 2.62 t / m3).

Consequently, the annual production at the quarry of Dzhamansaysky limestones, taking into account losses of 1.0% during loading and transport operations, will amount to 177.255 thousand tons. [3].

With this capacity, the requested limestone reserves will provide the cement plant with raw materials for 25 years.

The mineralogical composition of the averaged technological sample of limestone was studied by x-ray phase analysis.

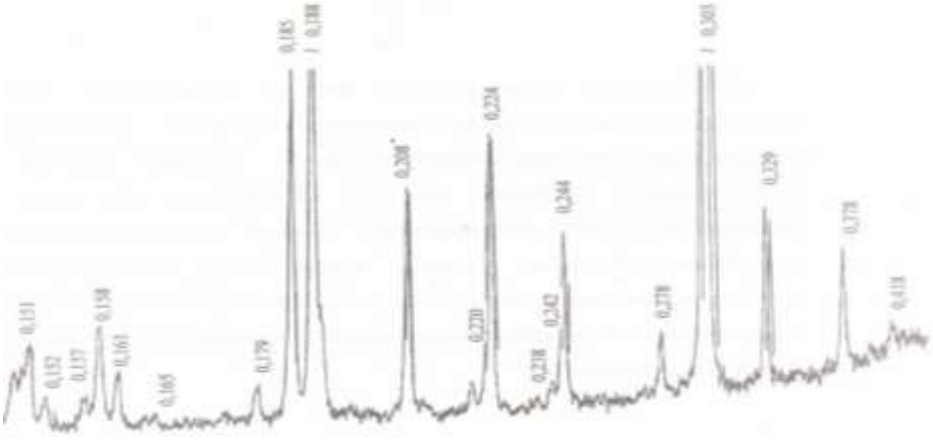


Figure 1: X-ray diffraction pattern of the averaged technological sample of limestone of the Dzhamansay-2 deposit, nm

Moreover, it was found that calcite with d / n = (0.378; 0.303; 0.244; 0.224; 0.208; 0.188; 0.185; 0.161; 0.158; 0.151 ...) nm prevails in the mineralogical composition of the averaged technological sample of limestone of the Jamansay-2 deposit (Fig. . 1). In addition, reflections of clay minerals with d / n = (0.418; 0.329; 0.278; 0.244; 0.179; 0.165; 0.152) nm [4] are identified on the sample diffractogram [4].

The results of determining the mineralogical composition of the averaged technological sample of limestone of the Dzhamansay-2 deposit are in good agreement with the data of chemical analysis.

On the DTA curve of the sample (Fig. 2), ten endothermic effects were detected at 157; 182; 217; 252; 295; 360; 418; 497; 728; 802ºC and four exothermic effects at 238; 583; 603 and 631ºC. The total mass loss in the temperature range of 60–900 ° C according to the thermogravimetric curve is 48.37%.

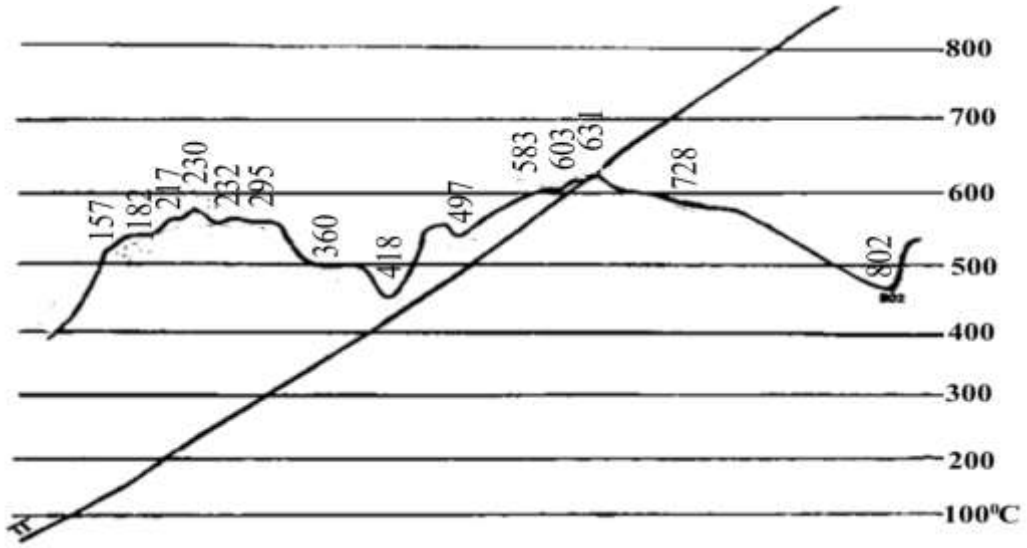
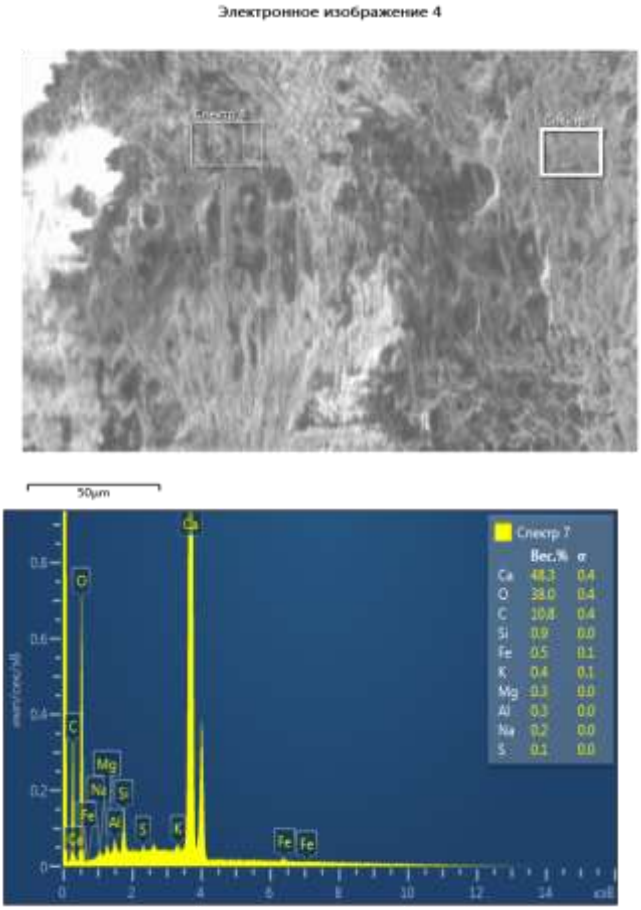


Figure 2: Heating curves of the averaged technological sample of limestone of the Dzhamansay-2 deposit

On the DTA curves (Fig. 2) of the limestone of the Jamansay-2 deposit, endo effects were detected at a temperature of 157; 182; 217; 252 and 295ºC associated with the release of water, endo-effects at a temperature of 360; 418 and 497 ºC are associated with the release of moisture from the clay component. Endo effects at a temperature of 728 and 802 ° C characterize the dissociation of calcium carbonate [5, 6].

The electron-microscopic analysis (Fig. 3.) made the morphological surfaces of the samples, and the microstructure was studied using a SEM scanning electron microscope - EVO MA 10, and the elemental analysis of the samples was carried out using an energy-dispersive elemental analyzer of the EDX brand (Oxford Instrument) - AztecEnergyAdvanced X-act SDD. Images of the samples were obtained at various scales, magnified 500 and 1000 times for each sample. Elemental analysis was performed at a magnification of 500 times (10 microns).



Element	Weight %	Sigma weight.%
C	10.85	0.36
O	38.04	0.37
Na	0.20	0.04
Mg	0.28	0.04
Al	0.27	0.04
Si	0.95	0.04
S	0.13	0.04
K	0.42	0.05

Ca	48.34	0.35
Fe	0.53	0.13
The amount :	100.00	

Figure 3: Electron microscopic images of limestone of the Dzhamansay-2 deposit, 1000x

III. CONCLUSION

Limestone showed the presence of particles of various sizes from 1.5 μkm to 18 μkm and more. Particles mainly have a plate-layer structure. This can be seen both on the chips and on the surface of the particles, where the edges of rhombohedrons and rhombohedral prisms are reflected. Crystals in the form of rhombohedrons and rhombohedral structures are characteristic of calcite.

According to the content of regulated oxides, the chemical composition of the technological sample of limestone of the Dzhamansay-2 deposit (CaO = 50.53; MgO = 0.18; P2O5 = 0.05; SO3 = 0.25; R2O = 0.54)% meets the requirements, presented by O'z DSt 2950: 2015 “Raw materials for the production of Portland cement clinker. Technical conditions ”to the chemical composition of carbonate raw materials for clinker production.

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