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PHYSICO-CHEMICAL ANALYSIS OF CLAY POWDER WITH SORPTION CHARACTERISTICS

Abstract. Clay soils have been and remain one of the most important industrial minerals. Clay and clay minerals are widely used in many areas of our society. They are important in geology, agriculture, construction, technology industries. Some more important applications include ceramics, paper, paints, plastics, drilling fluids, foundry metal alloys, chemical carriers, liquid barriers, and catalysis. The research and development activities of clay soil scientists in academia, government and industry are constantly leading to the production of new and innovative clay powder products, many of these new applications are the result of improved processing resulting in higher purity clay powders., with finer particle size and distribution., whiter and brighter color, modified surface chemistry and other physical and chemical modifications. Some new and improved clay products have been adapted or developed as paper-coated kaolins, advanced thickeners for paints, nanocomposites for plastics, columnar clays as specialty absorbents and catalysts, clays for liquid fertilizer slurries, animal waste absorption includes clay, kaolins, activated in an alkaline environment. Faster pouring of clay and very high modulus of break, high gloss and low friction.

Keywords: Kaolin, bentonite, palgorskite, carotenoids, anthocyanin, phleon, modification, adsorption, octahedral, porosity, sulfuric acid, grinding, bleaching, activation.

The urgency of the issue

Natural clays (kaolin, bentonite, palgorskite) naturally have low sorption properties, depending on their mineralogical and chemical composition, their enrichment and activation according to various properties gives excellent results. The presence of color in cottonseed oil indicates the presence of alpha- and beta-carotenoids, anthocyanins, phleon pigments.

The main composition of adsorbents is silicon and aluminum oxides (natural clays, synthetic aluminosilicates, silica gel, aluminum gel).

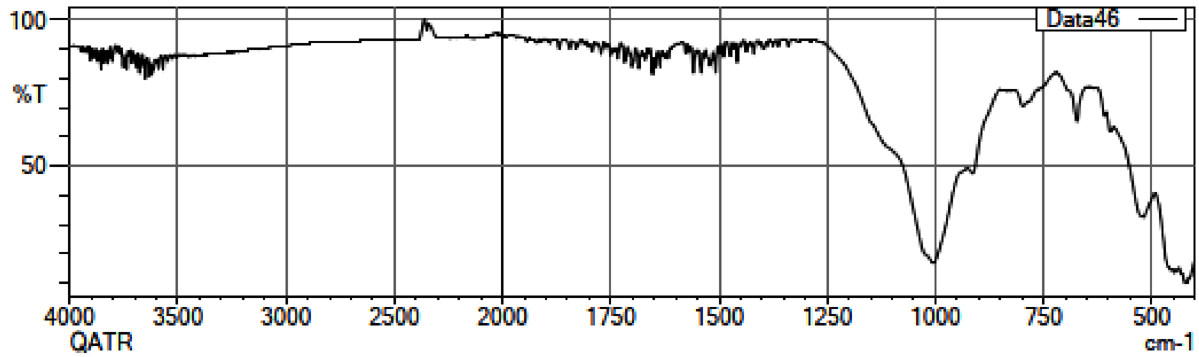
The absorbed substance in the bulk phase (gas, vapor or liquid) is called the adsorbent, and the absorbed substance is called the adsorbate.

The difference in chemical composition is not decisive in terms of adsorption properties in clay or soil. Of primary importance is the porous structure, which creates a large active surface of the adsorbent.

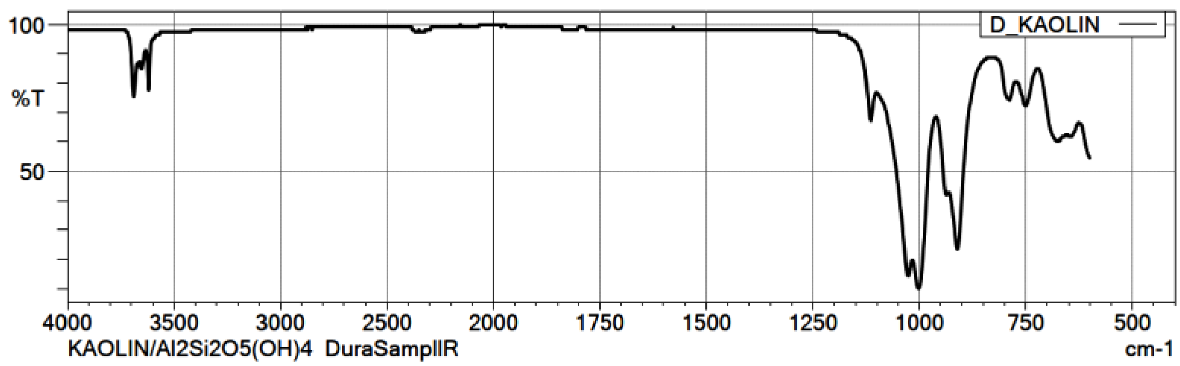
The industrial applications of the three most important types of clay minerals are varied and in most cases very different. This is primarily due to the fact that their physical and chemical properties are different depending on their structure and composition. The structure and composition of kaolins, smectites, and palygorskite-sepiolites vary greatly, although each uses octahedral and tetrahedral plates as basic building blocks.

The arrangement and composition of these octahedral and tetrahedral plates explain the major and minor differences in the properties of these clay minerals and therefore in their end use.

The layers of clay deposits contain clay powders of various compositions. Although their content is similar, their functions are very different from each other. From this we can say that the composition and structure should be similar. Clay powders with sorption characteristics are more often used for cleaning various products. The composition and structure of clay powders with sorption properties are not the same. On fig. 1 below shows the IR structure of natural clays (kaolin, talc).



a)



b)

Figure 1 (a, b). IR Spectroscopic Analysis of Kaolin and Talc

It also differs in hardness, color and other properties. As a result of the experiments, it was found that the amount of active metals (when treated with acid) should be removed from the structure of the clay flour in an amount of 1 to 3 percent, taking into account the composition and structure of the clay flour.

The sorbent properties of clay powder are also increased by stable organic substances. During the activation process, many changes are made to the treatment process, taking into account the impact of the acid. These changes are made mainly depending on the composition and structure of the clay. It has been repeatedly established that the structure of clay soils with sorption features mainly has an octahedral structure.

The adsorption capacity of palygorskite is due to its relatively large surface area and the net negative charge it contains, which attracts cations such as Fe(III). On (fig. 2) shows a diagram of the structure of palygorskite and its active surface areas (adapted from Bailey).

The aim of this work is to remove organic matter, rather than magnetite nanoparticles, using magnetite clay after Fe(III) adsorption. This process allows the use of additives produced during mining.

Palygorskite is a natural layer – a filamentous porous hydrated magnesian, aluminosilicate soil mineral type of a pure chemical element, usually an unstable system with the theoretical formula

Mg2Al2Si8O20(OH)2(OH2)4 • 4H2O. Due to the special structural properties of palygorskite, the layered-ribbon porous structure has many physical and chemical properties and is formed by alternating an octahedral layer of Mg, Al, O and a tetrahedral layer of Si, O.

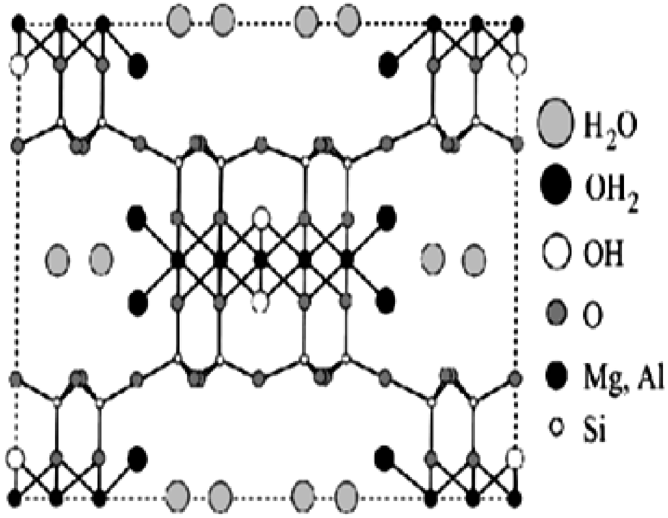


Figure 2. The structure of palygorskite and its active surface

A crystal structure diagram of palygorskite is shown in the FIC. The main building block of palygorskite consists of pairs of SiO_4 tetrahedra parallel to the S axis. Each band is connected to the next one by inversion of the SiO_4 tetrahedron along the oxygen atom.

In order, such tetrahedra are connected by continuous ribbons, starting from a vertical section along the C axis, forming phyllosilicate ribbons, forming octahedral layered-ribbon blocks, forming zeolite-like channels of approximately the same volume with two tetrahedral layers. 0.38 nm × 0.63 nm layers-strips and channel blocks are arranged alternately.

Palygorskite has a unique structure containing organic molecules and ions included in the internal structure of water channels and zeolite bonds, and exhibits good adsorption properties, rheological properties and catalytic activity.

Table 1.– Chemical composition of sorbent raw materials,%

Clay or sediment	SiO_2	Al_2O_3	Fe_2O_3	FeO	MnO	MgO	CaO	TiO_2	Na_2O	K_2O	CO_2	SO_3	Sulfide	Palygorskite powder
Paligorskit	36.1-	7.43-	2.44-	0.56-		6.76-	12.2-		1.43-	1.32-				
Tul	57.6	9.46	3.16	0.86		11.7	12.4		2.25	1.36				
Kaolin														
Angren	60.2	25.2	1.44			0.23	0.64	0.45		0.94		0.16		10.7
Bentonit														
Azkamar	53.5	25.1	3.96			5.22	2.16	0.15	2.16	0.83				7.26
Bentonit														
Tomditog′	58.4	14.0	10.4		0.04	3.10	2.50	0.65					1.17	
Bentonit	62.4-	10.2-	3.60-			2.98-	0.00-	0.50-	1.76-			Foot prints		4.92-
Angren	71.0	16.4	4.40			3.82	3.50	0.60	2.80					8.20

As a new adsorbent, the coal-clay powder mineral composite has attracted a lot of attention due to its potential application in water treatment. In recent decades, she has focused on the preparation and properties of one-dimensional carbon/palygorskite composites. In 2013, the modification and morphology of palygorskite, as well as adsorption properties, were investigated by a hydrothermal method using a range of biomass carbon sources, including xylose, fructose, sucrose, and cellulose.

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