composite was stored in a properly closed plastic container.

Study of Pb^{2+} and Cd^{2+} adsorption-desorption processes. 1 g of the adsorbent was mixed with 100 ml of 5 – 500 mg/L Pb^{2+} or Cd^{2+} solution, stirred at 200 rpm until reached equilibrium. Aliquots were taken at regular intervals for analysis for the content of Cd^{2+} и Pb^{2+} ions to study the kinetics of the process. The desorption process was carried out in the following way: 1 g of dried sediments obtained after sorption was mixed with 100 ml of distilled water, stirred at 200 rpm until reached equilibrium. The liquid was separated from the solid and analyzed for the content of Cd^{2+} и Pb^{2+} ions.

The extraction degree (E) was calculated using equation 1:

$$E = \frac{C_0 - C_e}{C_0} \cdot 100\% \quad (1)$$

where C_0, C_e are initial and equilibrium concentrations of metal ions, mg/L.

The adsorption capacity was calculated using equation 2:

$$q_e = \frac{C_0 - C_e}{m} \cdot V \quad (2)$$

where q_e is adsorption capacity, mg/g; m is the mass of adsorbent; V is the volume of metal solution.

The desorption degree (D%) was calculated using equation 3:

$$D = \frac{m_2}{m_1} \cdot 100\% \quad (3)$$

where m_1 is content of metal in clay after the sorption, mg/g; m_2 is the content of metal after desorption, mg/g.

Results and discussion

Characterization of samples. The studied clay belongs to sedimentary rocks and is a product of rock weathering. Dry clay itself is a lumpy mass of grey-brown color and earthy smell. The color of the clay indicates that it contains iron, potassium and calcium [20], which was confirmed by elemental analysis. Clay has a low swelling capacity. When mixed with water, it forms a plastic and viscous clay dough, which, after kneading and mixing, acquires the ability to take any shape and keep them after drying. Also, clay has a low hardness and can be easily pulverized by hand.

The primary task of the study was to identify the composition and structural features of the initial samples.

Using the SEM and EDAX methods, the qualitative and quantitative composition of the original natural clay was determined (Table 1, Figures 2 and 3).

Table 1 – Elemental analysis of natural clay by EDAX method

Element	C	O	Na	Mg	Al	Si	K	Ca	Fe
Weigh, %	17.02	39.26	0.89	2.24	6.70	18.57	2.77	5.59	6.97
Atomic, %	27.01	46.77	0.74	1.76	4.73	12.60	1.35	2.66	2.38

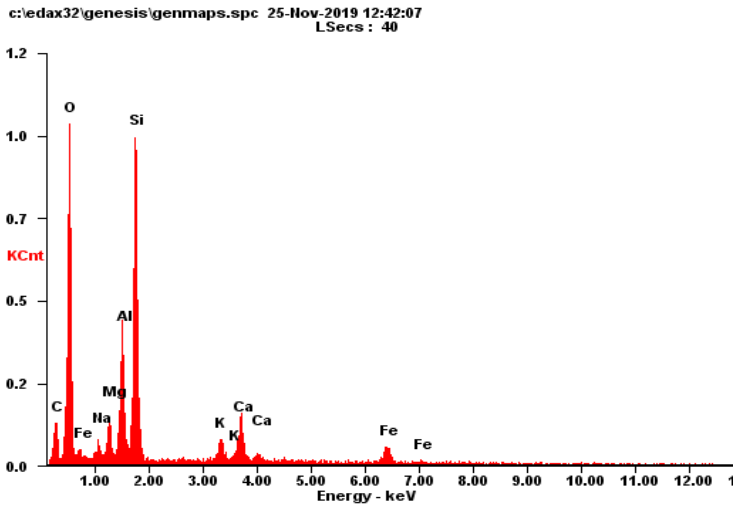

Figure 2 – Plot of the intensity of X-ray radiation over energy