

ID: 6022

Physico-Chemical Characterization and Valorization of a Natural Waste

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ABSTRACT

The experimental study was conducted on sediment from the K'sob dam in the M'sila region. In the first step, physicochemical characterization was carried out by: X-ray fluorescence, acidity, humidity, Swelling rate, Ash content were determined. The second step of the work is the recovery of sediments in wastewater treatment and more specifically the degradation of cationic dye.

Keywords: sediments, characterization, valorization, wastewater.

1. Introduction

Dams are exposed to a natural phenomenon called "siltation", this phenomenon is the result of mud deposits from soil erosion in watersheds and undermining of river banks.[1] This process is often accelerated by industrial activities, intensive agriculture, deforestation and urbanization. This results in the reduction of the depth and volume of available water and it can also affect water quality by trapping pollutants and promoting the reproduction of algae and other harmful organisms.[2] For this reason, extensive research has been carried out in search of an appropriate solution for the valorization of these sediments in different areas (agriculture, construction, road engineering and wastewater treatment) [3].

This study was carried out to assess the potential of locally available clays in the region of M'sila. The objective therefore of this work is to carry out a physicochemical and mineralogical characterization of this clay in order to conclude on the possibility of using it in the depollution and treatment of industrial wastewater as an adsorbent of cationic dyes.

2. Experimental

- the samples were taken from the surface upstream of K'sob dam located in M'sila (norh east of Algeria).
- The sample taken underwent the following unit operations:
Grinding to homogenize the powder sample
Distilled water wash
Drying in the oven for 24 hours ($T = 65^{\circ}\text{C}$)
ing: sieve 80 μm
- Physicochemical characterization of sediment K'sob dam:
Acidity
Humidity (%)
Porosity
Ash content
X-ray fluorescence

3. Results and Discussion

Table 1 : values of the different parameters relating to sediment K'sob dam

Parametres	pH	Humidit (%)	Swelling rate	Ash content
Value	8.12	1.37	1.28	20.25



Table 1: shows the values of the different parameters relating to our clay sample. We note that the pH value reveals the basicity of the agile sample which would be due to soluble and basic salts such as alkaline carbonates and bicarbonates or silicates, and which generally enter into the composition of clay. the humidity level value is low, this explains the non-hygroscopic character and confirms the low porosity value, demonstrating that our sample is considered to have very little the swelling rate is low which tells us that our clay sample is non-swelling. The ash content is quite high, it is due to the elimination of constitutional water, the decomposition of certain associated minerals such as carbonates and the combustion of organic matter. The chemical analyzes of the mud were carried out using the X-ray fluorescence spectrometer, the results are grouped in the following table

Table 2 : *Mineralogical composition of sediment K'sob dam.*

Element	Value
SiO ₂	38.81
Al ₂ O ₃	12.8
Fe ₂ O ₃	4.96
CaO	17.53
MgO	2.06
SO ₃	0.19
K ₂ O	1.61
Na ₂ O	0.26
P ₂ O ₅	0.25
TiO ₂	0.68

Silica, lime and alumina are the majority oxides in our sample. On the other hand, we note a high proportion of the loss on fire probably due to the release water and carbon dioxide. The SiO₂/Al₂O₃ mass ratio is 3.01. This can be explained by the high SiO₂ content. Some authors present this ratio as being the characteristic index of montmorillonite when its value varies between 2 and 5.5 [4-5].

5. Conclusion

The physicochemical characterization allowed us to highlight the phyllite and mineral phases as well as the chemical composition of the clay analyzed, the richness of this clay in Quartz which results in a high proportion of Silica and that the clay is of low porosity. This study was therefore essential before any application of this type of clay in the treatment and depollution Wastewater.

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