



Communication

Usability of Volcanic Tuffs in Wastewater Treatment Plant Wastewater

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Abstract

In the NW area of Romania (Salaj) are approved technologies prepare the volcanic tuff (zeolites) to Mirşid for use in: waste water treatment, animal feed, improving soil pH. In this area there have been researches on determining possible use of volcanic tuff that load on biofilters for wastewater treatment. In this context were prepared tuff aprons \varnothing : 30-40 mm, 40 - 60 mm, 60 - 120 mm and 120-240 mm with $\rho = 2.4 \text{ g/cm}^3$, an apparent $\rho = 1.6 \text{ g/cm}^3$, a breaking strength by clearing $> 360 \text{ daN/cm}^2$, a shock resistance $> 17 \text{ daN/cm}^2$ and a bulk $\rho = 0.7 \text{ T/m}^3$

Keywords: volcanic tuff, biofilter, animal feed, waste water treatment.

Preliminary study

Were studied active variants 1 and 2 where we determined the following:

- Chemical composition
- The exchange capacity.

Volcanic tuff was used Mirşid, Salaj county, which was provided by a company that can provide a granulation \varnothing 30-240 mm.

Under option 1 was applied technique synthetic ion exchangers where the radius of exhaustion is followed by regeneration phases. The experiment was done in repeated cycles where regeneration solution (8-10% NaCl) is reused in several cycles.

Sample characteristics:

- Filter = 100kg loading amount tuff accumulated $\varnothing = 1.5 - 4 \text{ mm}$
- Regenerate solution volume: 200 l NaCl solution Alcaniz
- Wash water volume: 600 l drinking water
- Waste water volume filtered by 20 cm
- Ammonia concentration: 40-45 mg / cm
- Filtration cycles - 4
- Total capacity retention tuff: -1/-23mVAL ammoniac/100 g tuff
- Specific charge: 5 to 1/1 turn / hour.

Option 2 is the passage of water through granular tuff columns in a single stage test to exhaustion and recovery of tuff loaded with ammonium, and water came from subject cleansing treatment plant wastewater treatment.

Sample characteristics:

- Quantity filter load: 50 kg tuff accumulated $a = 1-3 \text{ mm}$
- Volume of waste water through the filter: 33mc

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- Ammonium influent concentration: 11- 22 mg /dmc
- Power flow filtration column: 8.3 - 8.5 l/min
- Total exchange capacity achieved: 29.6 meq ammoniac/100g tuff

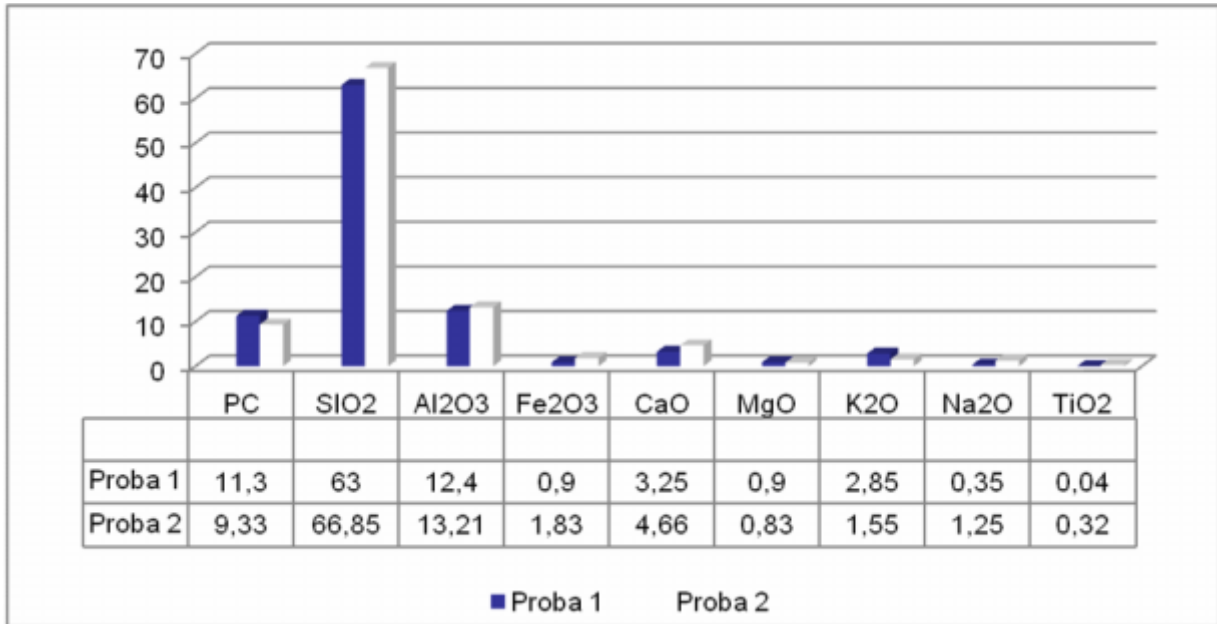


Figure 1. The chemical composition of the sample under study (%)

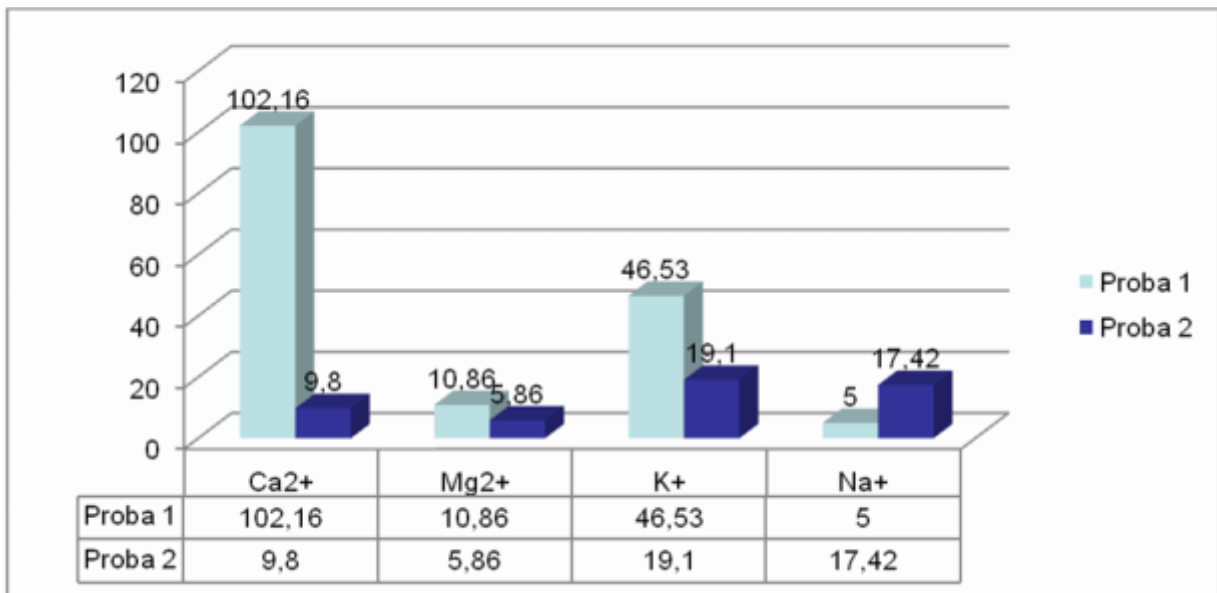


Figure 2. Exchange capacity (mVAL/100g)

The specific surface area of sample 1 (39.1 m²/g) is 2 x higher than sample 2 (16.1 m²/g).

Option 1

In a report tuff /water of 1/50, purified water, the concentration in ammonium ion is

reduced to 55-65% of initial content:

Table 1. Results for version 1

Number of water cycle	Water volume mc	g per 100 kg NH4 + retained tuff	g NH4 + released by the regeneration solution	g NH4 + free with water wash	g NH4 + absorbed by tuff	% Reduction in treated water
1	1/5 mc	136.9	31.4	6.28	99.2	65.8
2	2/5 mc	128.1	48.4	25.2	54.8	55.24
3	3/5 mc	124.4	21.1	45.2	58.12	58.9
4	4/5 mc	105.08	0	0	0	60.7

Washing of regeneration phases, the total amount of ammonia retained on tuff, only 27-57% is released in the solutions used tuff remainder absorbed until it reaches a load of 1 g NH4 + / 100 g tuff when tuff cannot be regenerated.

The treatment of waste water of 20 cm 0.8 cm impure solution (regenerative solution and

washing) requires another stage of purification or recovery.

VARIANT 2

In a report tuff / water 1/540, provides a reduction of 44% ammonium ion.

Water passage was performed in half of 2 mc - ions:

Table 2. Results for version2

Volume of water filtered tuff mc	Ammonium ions retained on the 50 kg tuff		% Reduction in ammonia in treated water
	mg by 10 mc	g by 3 mc	
3	18.35	55.05	100.00
3	16.1	48.30	70.00
3	9.02	27.06	77.90
3	9.02	27.06	77.90
3	9.21	27.63	70.46
3	6.45	19.35	55.60
3	7.86	23.58	55.00
3	7.93	23.79	60.00
3	5.16	15.48	45.00

Filtering the first 3 cm in the waste water to achieve a total reduction in the concentration of ammonium ions (from 18.35 mg / cc to 0 mg / cc), and further reduction is 20-50%. The amount of ammonia retained on the 50 kg is 267.44 tuff NH4 +, or NH4 + 534 mg / 100 g tuff, and the capacity retention is NH4 + 29.66 meq / 100g.

After downloading the filter in tuff richened in ammonium is used to discharge sludge conditioning and humidity exhaust sludge is about

82% (1:1 ratio, the content of dry sludge). After 14 days sludge thus obtained becomes manageable. One of the prerequisites is that the drainage system to ensure separation and water flow until the humidity of 60-65%.

- Power absorption and cationic exchange capacity of natural zeolites contained in volcanic tuffs makes this inert material that is found in large amounts (rock) in the County, to help maintain the purity of the environment.

- Reducing the amount of ammonia N by using volcanic tuff of particular interest for wastewater discharge into natural-treated.

- Based on the results obtained in the study of wastewater containing NH_4^+ < 50mg/cm³ is Proposed wastewater treatment plants with a supplementary phase of tuff filtration exhausted the possibility of using the sludge conditioning.

- This research has been addressed towards sustainable agriculture concept where sustainable agriculture and its development is a development model based on limiting production to the needs, not to exceed the regenerative capacity of plants and animals.

References

*** Romanian STANDARD Collection