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Studying Remove Sulfate Ions and Iron from the Water by Using Activated Carbon Record of Sewage Sludge

Firas Al Shami
M.S. Department of Physical Chemistry, Al-Baath University Homs, Syria

Tammam Monzalji
Ph.D. Department of Physical Chemistry, Al-Baath University Homs, Syria

Nawzat Nabgali
Ph.D. Department of Inorganic Chemistry, Aleppo University Aleppo, Syria

Abstract
The research aims to provide a practical study on converting sewage sludge in the province of Hasaka and the resulting exchange station in Ras Al Ain to useful product, where there is great potential in theory to convert the sludge as a carbon-rich material to the effective adsorbent material such as carbon. I studied coking process and chemical activation using zinc chloride and phosphorous acid at concentrations (3, 6) mol /L and at temperatures carbonization (450,700) ^{O}c.Then activated carbon characterization and by identifying specific surface and pore size in a manner BET. The use of activated carbonin the record to remove sulfate and ions iron.The results were promising and close to the results of the scientific research which opens the horizon and wide to use this method to get rid of large quantities of sludge.
Keywords: Sewage Sludge, Carbonization, Activation, Activated carbon.

1- Introduction

Sewage sludge is a by-product of the process of wastewater treatment. Traditional ways to get rid of them burning, landfill, composting and agricultural land. The volumeof sewage sludge has increased steadily with the increase in population growth. In addition, roads that have been mentioned above are non-sustainable ways. So, there is a need for alternative and more sustainable economic by converting this waste into resources can promote environmental sustainability. Given the nature of the carbon of the sewage sludge[1,2]. sewage sludge is the rest which is inevitable after the sewage treatment process.

Size of the problem is evident when reviewing the global production of sludge where the size of the production of sewage sludge reached in the European Union (EU) to 11.2 million tons of dry solids per year by 2005. China has produced 11 million tons of sludge in 2005. In US United (US), has been producing 6.2 million tons of dry sludge per year[1]. The disposal of sludge unsustainable ineffective and expensive economically and involve environmental risks of operations[2] Therefore, there is a need for an alternative more sustainable and economically by converting this waste into resources that can promote environmental sustainability. Because of the nature of the carbon of the sewage sludge, it can be a sample of sewage sludge Switch to activated carbon[1].

The first floated the idea of sewage to effectively convert coal reliable search was Razouk et al in 1960[3], followed by Beekmans and Park in 1971 [4]. Follow that many of the research in all countries of the world in order to obtain better conditions and yield the highest of the process, however, material adsorbent prepared from sludge sanitation, which can be called a violation of coal name effective were not satisfactory in terms of performance and features adsorption Therefore, the practical applications are still limited[5].

He studied Martin et al [6], the chemical activation of the samples of the sludge secondary exchange process pneumatically using sulfuric acid concentration of17.5mol/L and the degree of carbonization 700^{o}C and time t = 30min, was the specific surface of 253m^{2}/g and the size of micro pores 0.08cm^{3}/g and Meso pores 0.12cm^{3}/g.

The Chen[7], and his group studied the chemical activation process of sludge peptic anaerobically using zinc chloride, a concentration 5mol/L and the degree of carbonization 500^{o}C and time t = 2h, and found that the specific surface 647.4m^{2}/g.

He studied Jeyaseelan et al[8], chemical activation of sewage sludge process using zinc chloride, a concentration of 3 mol/L and the degree of carbonization 650^{o}C and time t = 2h, and found that the specific surface 247m^{2}/g..

Hestudied Bagreev et al[9], converting sewage sludge into an effective process of coal chemical activation using zinc chloride (saturated salt solution) and degrees of carbonization (400-600-800-950) ^{o}C and time t = 2h, and found that the highest value for the surface qualitative 397m^{2} /g at a temperature carbonization 600^{o}C as well as the highest volume of micro pores 0.122cm^{3}/g at the same degree.

He studied Lu and Lau[10], chemical activation of a sample of sewage sludge secondary process anaerobically using zinc chloride concentration of 5mol/L and the degree of carbonization 650^{o}C and time t =

120min, was the specific surface 309m^2/g.

In addition to the many research-centered to get the best specifications for effective coal from the terms of the preparation. We went in our research this for a practical application on a sample of sewage sludge generated by the local processing plants to see whether there was a possibility to reach an effective coal.

We have chosen sludge from sewage treatment to the city of Hasaka existing station Ras Al Ain area.

In this context, this research is a continuation of efforts to sustainable treatment of sludge, with an economic value to the productcan be used in the purification of contaminated water from different types of pollutants.

II–The Importance of Research and Its Aims

Summed up the importance of this research two major points namely:

First, prepare the coal-effective sewage sludge and accumulated a very large, which is also an effective contribution to preserving the environment.

Second, the use of this effective activated charcoal in the removal of ions sulfates and iron.

III–Experimental

3-1- Devices used characterization of physical and chemical

3-1-1- specific surface measuring device in a manner BET.

Gemini type Of product by Micromeritics company is in this device specific surface active coal measure in a way BET [11] by adsorption of nitrogen at a temperature of the liquid nitrogen (-195°C) from the linear conversion isothermcan by determined the volume of gas V_m corresponding to the layer of adsorbed single and then draw a relationship $\frac{P}{V(P_0-P)}$ in terms of $\frac{P}{P_0}$ by linear relationship:

$$\frac{P}{V(P_0-P)} = \frac{1}{V_m C} + \frac{C-1}{C\,V_m} \cdot \frac{P}{P_0}$$

Where:

V- Volume of gas available at the balance by one gram of coal from the adsorbent material when pressing P.

P_0- Saturated vapor pressure.

C- Fixed the degree of adsorption heat.

After selecting V_m and C than a mile rectal junction with samples axis linear converter according to the previous equation can be specific surface of the relationship account:

$$S_{BET} = V_m \cdot \frac{N}{V_M} \cdot \sigma$$

N- Avogadro's number.

V_M-Molar volume of N_2 gas.

σ- Space clip N_2 molecule in excellent condition and is equal to 16.2A^2.

3-2- Tools and materials used

3-2-1- Tools used:

- Abandonment of the Electric pump Leybold.AG German companyattached to a glass flask with a capacity of 1L slot offenders equipped to suppress Bokhnar diameter of 11 cm and a paper with a porous medium nomination.
- Heater with a magnetic mixer from Japanese company Global Lab.
- Cylinder glass 100-mL beaker glass and different capacities baeshr.
- Electric crematorium at different temperatures programmed up to 1200 oc (Wise Therm) of produced by the German company Mert.
- Programmer dryer of type (Memmert D06836) of produced by the German company Mert.

3-2-2- Materials used:

- Zinc chloride from BHD company.
- Hydrochloric acid 37% by weight of the Merck company.
- Acid nitrogen 69% by weight of the Merck company.

VI- Prepare charcoal effective

The sewage sludge as most of the waste is rich in organic matter carbon volatiles [12]. It was obtained sludge from secondary settling basins to the treatment plant in Ras al-Ain in the province of Hasaka northern Syria, and then was dried at class 105 ° C until fully dry and then crushed and sifted for size darling homogeneous dry sludge and then divided into two parts:

The first section (ACZ)

Was treat with a solution of zinc chloride with a focus 6M using a gravimetric ratio of 1: 1 (zinc chloride solid:

sample), leaving the mixture for five hours at grade 85 ° C and then ran hard and dry and carbonization at grade 700 ° C for a period of an hour and a half. The resulting wash five times hydrochloric acid 3M and then wash with water skimmed strays even the stable of the value of output of washing pH value at (pH = 6-7). After that was crushed by the previous sample and sifted sieve (0.45µm) was saved for characterization and treatment.

The secondsection (ACP)

Was treatment of phosphorus acid, a focus so that 3M used 2mL of liquid for every 1g solid, leaving the mixture for five hours at grade 85 ° C and then ran hard and dry and carbonization when grade 450 ° C for a period of an hour and a half. The resulting wash five times hydrochloric acid 3M and then wash with water skimmed strays even the stable of the value of output of washing pH value at (pH = 6-7). After that was crushed by the previous sample and sifted sieve (0.45µm) was saved for characterization and treatment.

V- Results and discussion

5-1- Specific surface measurement

The specific surface measuring of samples of activated charcoal in a way BET on your type of Gemini product by Micromeritics company, which depends on the adsorption of liquid nitrogen at the grade -195oC coal has shown activated chloride zinc surface qualitative 305.67 m2 / g and the total size of the pores 0,299 cm3 / gand the average pore diameter 39.1 A, the activated charcoal phosphorus acid surface has shown a qualitative 259.69 m^2/g and the total size of the pores 0,237 cm3/gand the average pore diameter 36.5 A.

It wasthe study ofthe sizeAl Macro Poresdepending onBETdevice thatwasthroughspecific surfaceof samplesof activated charcoalstudy, noting that theInternational Union of Pure and Applied Chemistry(IUPAC)Classporesaccording to thedimensionsinto three types:

1- Micro Pores$\bar{r} < 2nm$
2- Meso Pores2-50 nm
3- Macro Pores$\bar{r} > 50nm$

IV- Contaminated water treatment

It has been studied coal capacity of existing water purification in contaminated water sources in collaboration with the Directorate of Water Resources province of Hasaka. Set points harvest samples from various water sources, was chosen for the study of several points where water pollution and has previous sample processing effective coal ACP record in this research, Which it is characterized by the kind of coal Top specific surface 259.69 m^2 / g and meso pores (Meso Pores), In order to obtain water conforms to specifications and determine the amount of coal needed to purify one liter of water, The use of continuous flow filtration. Samples were obtained from the contaminated water from different water sources, a river Jgjg samples (A-B) and South Lake (C-D) West Lake (E-H) and a teak me on two samples from the same source from the beginning of the source and end and time different processed coal record. The concentration of pollutants has identified the way spectral color and clarified the results according to the schedule (4) were determined adsorption efficiency of coal from the relationship:

$$T\% = \frac{C_1 - C_2}{C_1}$$

Where:

T% - The efficiency of purification, a percentage skim the concentration of a particular pollutant ion.

C_1 - The concentration of the ion in the contaminated sample.

C_2 - The ion concentration in the sample after purification.

It has been studied efficiency changes in terms of the appropriate amount of water through one gram of coal.

6-1- The efficiency of removal of sulfates:

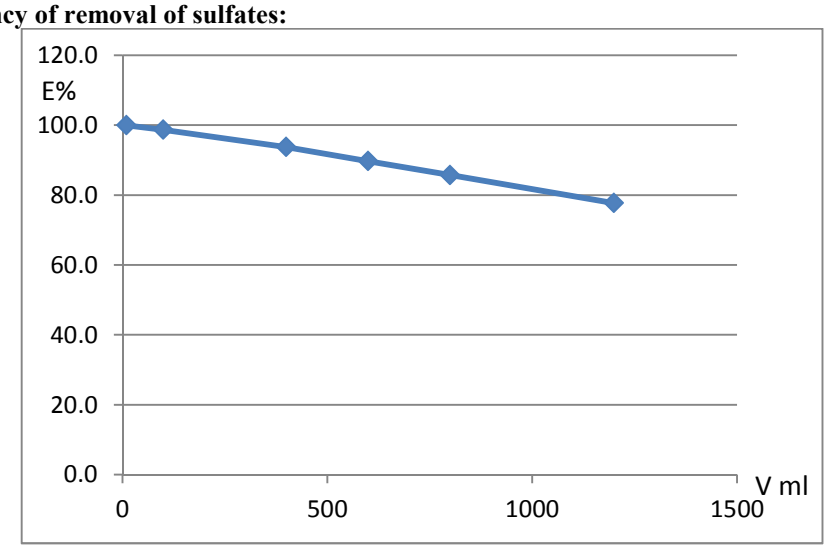

Figure 2 medium efficiency to disarm college sulphates samples of different water

6-2- The efficiency of removal of iron:

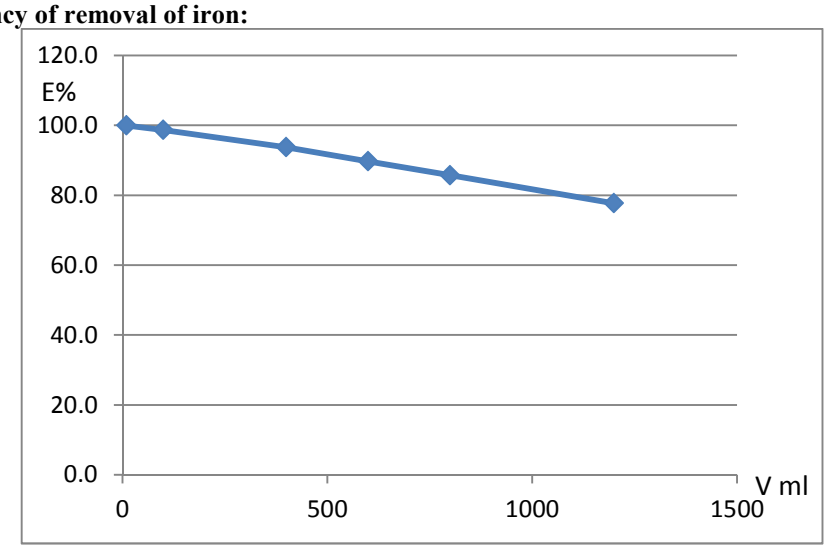

Figure 3 medium efficiency to disarm iron to different water samples

VII- Conclusions

It was obtained activated carbon chemically from sewage sludge existing in abundance in water treatment in Ras Al Ain station, This method led to obtain activated carbon reached specific surface area of 259.69 m^2 / g in order to activate the chemical and charring a single step using zinc chloride 6 M and the degree of charring amounted to 450 ° C for a period of an hour and a half.

The majority of water samples contaminated fresh cut and fit to drink.

Coal used showed every time Activity adsorption good when removing the sulfate and chloride were well water purification and analysis show good efficiency when using 1.25g of coal to address one liter and the flow is acceptable.

While the efficiency of the cultured iron triple acceptable where you need 10g of coal per liter of water to get on the outcome of a match.

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