УДК 541.183:544.725 **DOI: https://doi.org/10.56122/..v2i2%20(26).454**

THERMAL RESISTANCE ANALYSIS OF MODIFIED ADSORBENTS

Usarov Azodbakht BeknazarUgli -Doctoral student Tashkent chemical and technological institute,
Khandamova Dilnoza Kenjaevna - candidate of chemistry science, senior lecturer
Tashkent chemical and technological institute, Uzbekistan
ORCID: https://orcid.org/0009-0001-9828-9679
Boboev Odil Obidjon Ugli - Tashkent chemical and technological institute,
Uzbekistan PhD student
Nurullaev Shavkat Payzievich - candidate of chemistry science, professor
Tashkent chemical and technological institute, Uzbekistan
ORCID: 0000-0002-4573-0264
Alikhonova Zuhrikhan Saitkhodjaevna - candidate of chemistry science, associate professor
Tashkent chemical and technological institute, Uzbekistan
ORCID: 0000-0001-8958-5604, e-mail: alixonovazuxraxon22@gmail.com

Abstract

This research study investigated the analysis of thermogravimetric (TGA, DTA) spectra of Navbahor bentonite and Angren kaolin, as well as their samples modified with organic substances such as trimethylammonium (TMA) and triethylammonium (TEA).

Keywords. Navbahor bentonite, Angren kaolin, modification, trimethylammonium, triethylammonium, thermogravimetry, endothermic and exothermic process, mass loss, heat energy.

АНАЛИЗ ТЕРМИЧЕСКОГО СОПРОТИВЛЕНИЯ МОДИФИЦИРОВАННЫХ АДСОРБЕНТОВ

Усаров Озодбахт Бекназар ўғли – *Докторант* ***Ташкентский химико-технологический институт, Узбекистан***
Хандамова Дилноза Кенжаевна - *кандидат химических наук, старший преподаватель*
Ташкентский химико-технологический институт, Узбекистан
ORCID: https://orcid.org/0009-0001-9828-9679
Бобоев Одил Обиджон угли- *Докторант* ***Ташкентский химико-технологический институт, Узбекистан***
Нуруллаев Шавкат Пайзиевич - *кандидат химических наук, профессор*
ORCID:0000-0002-4573-0264
Алихонова Зухрихон Саитдходжаевна - *кандидат химических наук, доцент*
Ташкентский химико-технологический институт, Узбекистан
ORCID: 0000-0001-8958-5604, e-mail: alixonovazuxraxon22@gmail.com

Аннотация

В данной научной работе проведен анализ термогравиметрических (ТГА, ДТА) спектров бентонита Навбахора и каолина Ангрена, а также их образцов, модифицированных органическими веществами, такими как триметиламмоний (ТМА) и триэтиламмоний (ТЭА).

Ключевые слова. Навбахорский бентонит, Ангренский каолин, модификация, триметиламмоний, триэтиламмоний, термогравиметрия, эндотермический и экзотермический процесс, потеря массы, тепловая энергия.

Introduction

Modification of Navbahor bentonite and Angren kaolin with various, especially cationic, surfactants increases the effectiveness of their practical application [1-3]. Such measures lead to a further increase in the number of active centers with high energy in the adsorbents, as well as a positive change in the structure of the pores in the bentonite and kaolin, which are the raw materials obtained [4-5]. From such cases it is important to study the thermal resistance of adsorbents

obtained on the basis of modified bertonites in the study of physical molecular mechanisms of adsorption of qtbli and non-polar organic substances to adsorbents, since thermal processing of activated bentonites, determining the possibilities of preserving their beneficial properties at high temperatures is an urgent issue [6].

The obtained results and their analysis

The properties of adsorbents obtained based on modified bentonite and kaolin, their endothermic and exothermic effects (DTA), sample mass changes with increasing temperature (TGA), as well as the amounts of heat absorbed or released during sorption processes (DSC) were determined. Based on the studies, the thermal stability of adsorbents allows you to interpret the processes of dehydration associated with changes in temperature, as well as the acceptable temperatures allowed for drying adsorbents, the amount of sorbent weight loss and the changes that occur in the crystal structures of adsorbents and make appropriate conclusions.

The thermal stability of adsorbents was studied using the thermogravimetric method on a DTG-60 SIMULTANEOUS DTA-TG APPARATUS (SHIMADZU, Japan). Dervitogram analyses were performed at a rate of 10 degrees/min, and the experiments were conducted in a neutral argon atmosphere with modified adsorbents, a gas flow rate of 80 ml/min, in a 10.0 mm diameter, lidless crucible made of alumina and platinum, resistant to temperatures up to 1650°C. S-type thermocouples (Pt/PtRh 10%) with high sensitivity to process temperatures (T=20-1650oC) were used. Heating of adsorbents based on modified bentonites was carried out in a dynamic mode under atmospheric pressure, and the determination of the values of endothermic and exothermic effects was carried out in the temperature range from 20.13 0C to 1001.35 0C for a period of 0.26-105.9 minutes.

Thermogrammetric (TGA) analysis of unmodified PBG bentonite and adsorbents activated with trimethylammonium (TMA) and triethylammonium (TEA) is presented in Table 1.

Table 1.

Thermogravimetric analysis of unmodified PBG bentonite and TMA, as well as TEA-activated adsorbents

№	PBG		TMAB		TEAB	
	Temperature, ^{0}C	Reduction of adsorbent mass%	Temperature, ^{0}C	Reduction of adsorbent mass%	Temperature, ^{0}C	Reduction of adsorbent mass%
1	114,5	4,343	108,6	3,951	128,5	5,021
2	163,01	6,708	238,5	5,913	208,57	6,018
3	798,9	11,41	585,7	10,148	895,48	11,971
4	1005,4	11,86	1006,3	12,754	1006,81	12,803

According to the results of thermogravimetric analysis, the unmodified PBG-branded bentonite adsorbent with a temperature of up to 114.5°C should have a mass reduction of 0.389 mg, or 4.05% (at the expense of the loss of physical sorbtated water and gas molecules in the adsorbent content), while in the temperature range of 114.5-163.01 0S, the decrease in mass weight the constitusion located in its pores is due to the loss of water and other molecules that are firmly connected to the sorbent, changes were observed in TGA spectrum peaks due to the gradual progression of dehydrocylation processes in the adsorbent structure in the range of temperature 581.65-798.9 0S to 3.145 mg or 3.93% (due to decarboxylation (combustion) of organic cations to the formation of SO2, H2O, CO, N2 and oxides) as well as temperature 798.9-1005.4 0S.

So, when the PBG sorbent was heated from room temperature to 1005.4 0C, it was found that the mass weight value decreased to 1.18 mg (9.98%) (Figures 1 and 2).

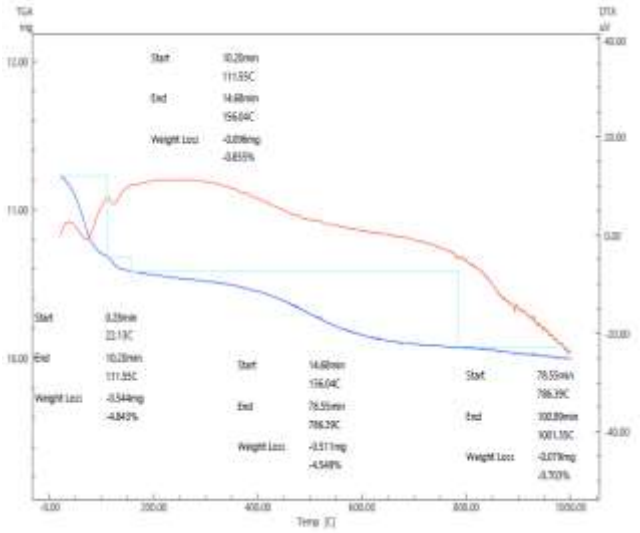

Figure 1. TGA spectra of PBK

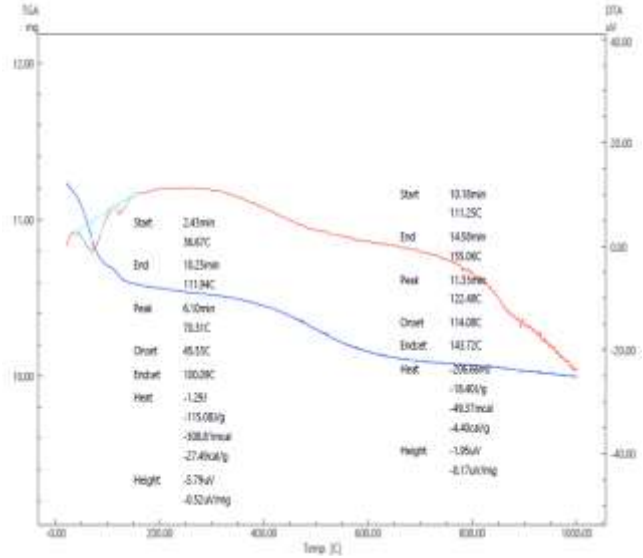

Figure 2. DTA spectra of PBK

DTA and TGA analyzes of modified TMA and TEA bentonites are presented in Figures 3-6.

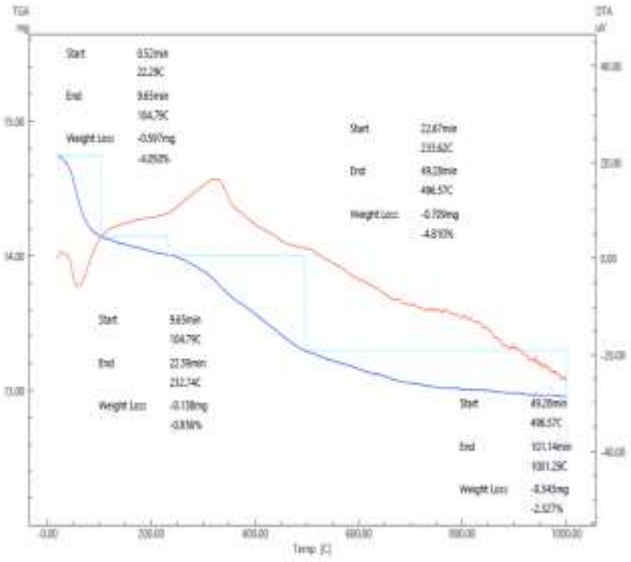

Figure 3. TGA spectra of TMAB

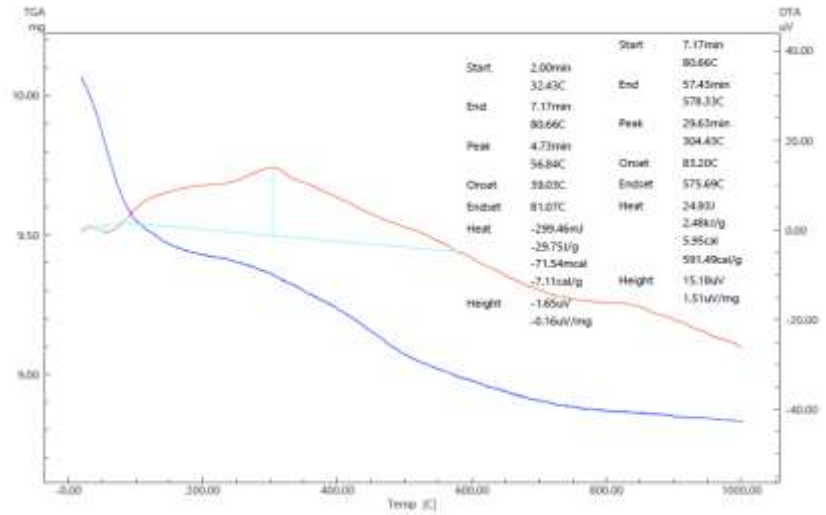

Figure 4. DTA spectra of TMAB

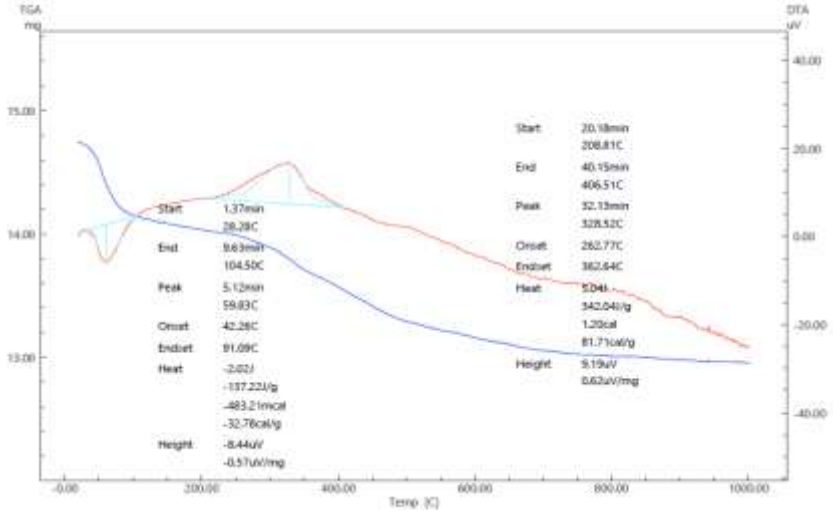

Figure 5. TGA spectra of TEAB

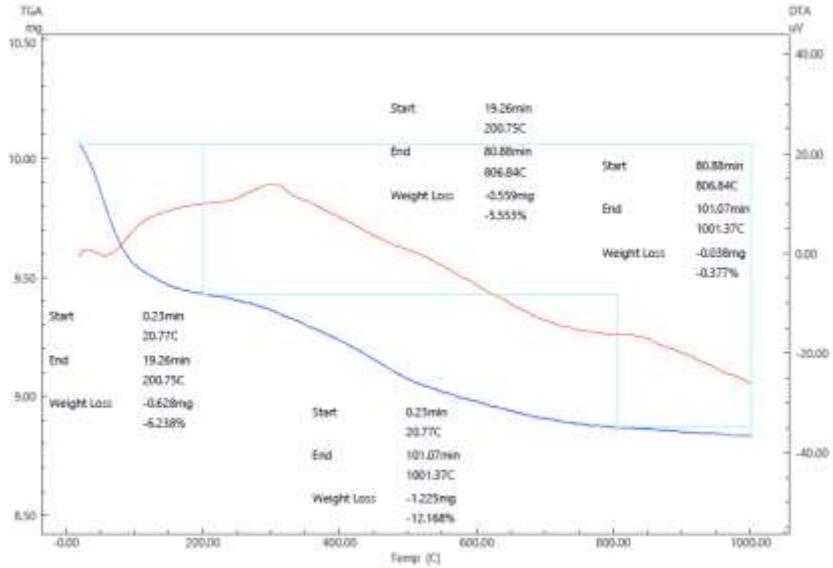

Figure 6. DTA spectra of TEAB

Based on the results of the research carried out, the decrease in mass in PBG-branded bentonite in 11.86% modified TMAB and TEAB sorbents in the temperature range of 25.0-1005.4 0S is 121.05 in PBG, 142.31 in TMAB and 32.97 J/gr in TEAB, while the formation of exothermic process Peaks is 352.11 in Tmab and 2618.2 in Teab a thermal release of GR amounts was

observed. These phenomena are explained by the dependence of the process on the nature of the cations being exchanged.

List of references.

1. Tawfik A. Saleh, Mujahid Mustaqeem, Mazen Khaled Water treatment technologies in removing heavy mtal ions from wastewater: A review. Enviromental Nanotechnology, Monitoring & Management Volume 17, May 2022, 100617.
https://doi.org/10.1016/j.enmm.202.100617
2. Drosos, M., et al. (2021). “Phosphate and Ammonium Removal from Wastewaters Using Natural-Based Innuvative Bentonites.” Molecules, 26(21), 6684.
3. Mazumdar, A., &Mazumdar, P. (2021). “Determination of total Iron Content in Water Using UV-Vis Spectroscopy.” Journal of Environmental Chemical Analysis, 43(2), 112-118.
4. Li X., Wu D. Nanoclay Applications in Advanced Materials: Bentonite-Based Nanocomposites//Journal of Nanotechnology. 2025 №42(7), P.1312-1324.
5. Dinis, A., et al. (2020). “Application of Langmuir Adsorption Model for Removal of Heavy Metals.” Environmental Science and Pollution Research. 185(8), 452-465.
6. B.Travalia and S.Forte, “New proposal in a biorefinery context: recovery of acetic and formic acids by adsorption onhydrotalcites,” Journal of Chemical Engineering and Data, vol.65, no.9, pp. 4503-4511, 2020.

УДК 541.183:544.725

ПРИМЕНЕНИЕ МОДИФИЦИРОВАННЫХ АДСОРБЕНТОВ ДЛЯ ИЗВЛЕЧЕНИЯ ОРГАНИЧЕСКИХ ВЕЩЕСТВ

Усаров Озодбахт Бекназар ўғли – Докторант Ташкентский химико-технологический институт
Бобоев Одил Обиджон угли – докторант Ташкентский химико-технологический институт
Нуруллаев Шавкат Пайзиевич - кандидат химических наук, профессор
Ташкентский химико-технологический институт
ORCID: 0000-0002-4573-0264
Алихонова Зухрихон Саитдходжаевна - кандидат химических наук, доцент Ташкентский химико-технологический институт
ORCID: 0000-0001-8958-5604
Ишметов Расул Жуманиязович - доктор технических наук, профессор
Ташкентский химико-технологический институт, Узбекистан
*Университет Маъмуна, Ургенч, Узбекистан
ORCID: 0009-0002-8123-5591, e-mail: alixonovazuxraxon22@gmail.com

APPLICATION OF MODIFIED ADSORBENTS TO EXTRACT ORGANIC SUBSTANCES

Usarov Azodbakht Beknazar Ugli - Doctoral student
Boboev Odil Obidjon Ugli - PhD student
Nurullaev Shavkat Payzievich - candidate of chemistry science, professor Tashkent chemical and technological institute
ORCID: 0000-0002-4573-0264
Alikhonova Zuhrikhan Saitkhodjaevna - candidate of chemistry science, associate professor
ORCID: 0000-0001-8958-5604
Ishmetov Rasul Jumaniyazovich - doctor of technical science, professor