ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

Vol. 5, Issue 4 , April 2018

Spectral Characteristics of the Cotton Oil the Miscella Before and After Refining the Synthetic ZeolitOf NaX

SuvanovaFU.,SerkaevQP.,N.A.Khujamshukurov

Prof.Karshi Engineering-Economic Institute[1], Karshi, Uzbekistan,
Prof.Tashkent chemical technology institute[2], Tashkent, Uzbekistan,
Vice rector Tashkent Institute of Architecture and Civil Engineering[3], Tashkent, Uzbekistan.

ABSTRACT:We studied the possibility of applying synthetic zeolitsNaX and CaX with different binders for selective ennobling the refined miscell and cotton oil. For the amount appraisal of refining the miscell by zeolits we used the spectral method of comparison of areas. The presented results show that the largest effect lighted bygossypol,carotenoid, and their derivatives reach to the synthetic zeolitsNaX (binding substance kaolinit). So, this process can byappliedboth as refinement and hydrogenization production.

KEYWORDS:gossypol,carotenoid, zeolite,NaX, CaX, glycerine, cotton oil, miscall, hydrogenizate, gossipurpurin, gossiverdurin, technology.

I.INTRODUCTION

Solid fats of different fixing are obtained by the main method of hydrogenising the plant oils. Plant oils, in particular, the cotton oil, are esters of glycerin and fatty acids [1].However, besides triassilglycerin's, in the content of the oil, are extracted many attendant things, the amount and quality which depend on its production method. Main data about the amount and quality of the attendant things in different fats and natural oils are resulted in the work [2-3].

With the purpose of decreasing the content of the attendant things in plant oils, subjected to hydrogenization, technology is stipulated their refinement. For implementing this process is a primarily used alkaline reagent. However, some things, attendant to the oil and the solvent (if it is used) don't react with alkali and form new complex compounds which transfer to the content of the oil, permitting to hydrogenization. Though, their amount, at first, is not great, they decrease the activity and stability of the hydrogenising catalysts [4-7].

II. SIGNIFICANCE OF THE SYSTEM

With the purpose of decreasing the content of the attendant things in plant oils, subjected to hydrogenization, technology is stipulated their refinement. For implementing this process is primarily used alkaline reagents.However, some things, attendant to the oil and the solvent (if it is used) don't react with alkali and form new complex compounds which transfer to the content of the oil, permitting to hydrogenization. Though, their amount, at first, is not great, they decrease the activity and stability of the hydrogenising catalysts.

III. LITERATURE SURVEY

Among the natural oils, the cotton oil differs with additional contents of gossypol and its derivatives [8]. Gossypol contains derivatives: combined gossypol, gossipurpurin and gossiverdurin which belong to the group of poisoned things. When keeping oil contained seeds and extracting the oil under the state of moisture and heat, gossypol is partly combined with protein, amino acid and phosphatid, as a result, it looses the reaction capacity and toxic, and passes to the derivative group, not contained free aldegid group and having colour from yellow to black: gossifulvin, gossikaerulin and others.

ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

Vol. 5, Issue 4 , April 2018

It is true, that the extractive oil, containing changeable product and converting into gossypol is considered more complicated raw material for refinement production. It is difficult to change and combine the form of gossypol, but sometimes it is impossible to get alkaline refinement of light oil with the colour of 8-10 red units while 35 yellow. Gossypol, having rather strong acid properties, reacts as aldegid and polyphenol, at the expense of which decreases the velocity of hydrogenization of triassil glycerines. Besides the studied components, of attendant plant oils, they contain colouring things: chlorophyll and carotenoid's**[**6].

Having been shown in the work that in the contain of refined oil, permitting to hydrogenization, are transferred residues of sodium soaps, which negatively affect to the activity and other indices of the obtained catalyst. The most important role depends on the attendant things containing the solvent. First of all it belongs to sulphur, phosphorus and other compounds, containing industrial (extractive petrol, hexane and others) solvents of oil extraction production. In the work **[**9] was studied the influence degree of refining the triassil glycerines of soya oil, and also the effect of additions of some other things, to thevelocity and selectivity of hydrogenizing the refined soya oil. It is determined that the recurring refining of the oil results in increasing the velocity of hydrogenizing, and chromatograph on Al_2O_3 still increased the velocity of hydrogenizing.In the patent [10] is protected the method of refining and studied the mixture of oil and fat with tiny dispersed solid adsorbents which capable to adsorb the coloured dashes, gases, containing oxygen and others. The removal of the catalyst and adsorbent is produced by the way of electro filtrations. For creating the filtration layer, are used granules of no spherical forms of inert materials, which include, at least, one mineral containing crystal SiO_2. By this method, it is possible to do different operations.

For example the mixture of the refined oil with catalysts and adsorbents before hydrogenizing it and electro filtration of hydrogenizate.For refining the oil and fat it is also recommended **[**11] to use 0,01% tiny dispersed solid adsorbents, for example blenching and fullers soils, activated coal, kizelgur and others. While hydrogenizing the cotton oil in fusion stationary catalysts, the authors **[**12] of the work use a separate adsorber, filled with activated coal. The oil, passing through the adsorber, is ennobled (reduces the acid amount and others) and joins the columned reactor, which depends on hydrogenization. Such organization of the process permitted to increase the selectivity and stability of triassil glycerines.I.V.Gavrilenko used [13] silicate helium to refine the cotton oil from gossypol, free from fatty acid and others. In the work [14] it is recommended to use kapron sorbent for separating gossypol from cotton oil miscell. But this method being difficult for regeneration, wasn't applied in industry.As shown in the work [14], the greatest effect of illuminating provided different groups of natural clays silica claying types of different deposits. For increasing the sorption capacity, they were used after thermal activations. Recently in catalyst systems as adsorbents, it was often used synthetic zeolits, which have selective capacity to absorb different things.

IV. METHODOLOGY

Raw materials. As the initial raw materials, was used cotton oil and miscell, reserved in the joint venture of Tashkent oil combinate (Republic of Uzbekistan). Refining the cotton oil with iodine number 109,3% J_2 , the acid number 0,2 mg KOH, the colour 5-11 red unit in 13,5 sm layer the refined cotton miscell, obtained after separating with concentration 53,0%,the acid number 0,4-0,5 mg KOH, the colour 13-14 red unit in 35yellow in 13,5 sm layer. The colour of the cotton oil in the miscell by the means of VNIIJ-16 by comparative method [15]. The oil capacity of adsorbents was determined as the following formula [16]:

$$X = \frac{P_1 - (P_2 + P)}{P} 100, \qquad (1)$$

here:P_1- the weight of funned with filter, clay and absorbed oil, g;
P2 –the weight of the funnel, with filter, saturated oil, g;
P- dose by weight of the sorbent, g.

The contain of the raw materials in the solvents and miscell was determined by micro method with the catalyst Reney[17]. Differential thermal analysis (DTA) of the adsorbents existed on the base [18]. The contain of phosphatids, soaps and other things in the oil and miscell was analyzed by the method of [16]. Spectral references of the oil and miscell were taken in the region of the light by the implement Raduga -1 ("Chem. automatics"**).**

ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

Vol. 5, Issue 4 , April 2018

Zeolits. Differing from the activated coal zeolits are heteropolar ionic things. On their surface, are placed positive charges (kation of little radius, proton atoms of hydrogen of hydroxyl groups with acid character). The affinity of zeolits to insatiable organic compounds, polar molecules and others permits to remove from the solutions of grey organic compounds, polar molecules and others permits to remove from the solutions of grey organic compounds and from hydrocarbons-oxygen [19]. The advantage of zeolits is that with their help it can by cleaned much amount of things while little concentrations of zeolits.

Chemical formula of the zeolits is as following:$(R_2\ R)\ OAl_2O_3\ .\ n\ SiO_2.\ mH_2O$, (2)

here:R_1-complete univalent cation (Na+,K+, Li+);

R_2 –complete two valentcation;

m, n-coefficients representing the relation SiO_2:Al_2O_3 (from 2 to 10).

The work [19] is informed about using zeolits while refining fats with separating mono and three olefins. It is shown that zeolits with – diameters of pore from 3 to 15 Å are able to sorbs free fatty acids, water, mucus, phosphatids, colours, flavouring and smelling substances. Satisfactory results have been obtained while usingzeolits X and Y with the diameter of pore 8-9 Å. Zeolits don't develop isomeric properties of triassil glycerines.Refining the oil and fats can be produced in one, two and more adsorbers with applying different marks of zeolits depending on the aim. As regeneration solvent of zeolits can be used methanol, propanol, hexane, sulphuric ether and others [19]. As it is known that through the window to the cavity of zeolits can be penetrated these molecules, effective diameter which doesn't increase the diameter of the window. This is explained as the selective effect of molecular sieve. The analysis of different marks of zeolits showed the possibility of using them for selective extraction from plant oils of different groups of attendant substances, having toxic nature. Zeolits of X presents interests depending on SiO_2: Al_2O_3.

Laboratory installation for selective refining and hydrogenizing the oils and miscalls. The Scheme of laboratory installation is presented in figure 1 for selective refining the cotton oil (or miscell) in stationary layer of the adsorbents in dynamic conditions. The principal work of this installation is as following: From the storage tank 1 the refining cotton oil (or miscell) is passed to the heater 3 with the help of the pump 2, where it is heated till 50-60°C. Heated oil (or miscell) comes into glass adsorber 5, where it is refined from harmful things in the layer of zeolits. The refined oil (or miscell) comes from adsorbers into the storage tank of miscells, from where it is directed to hydrogenization.

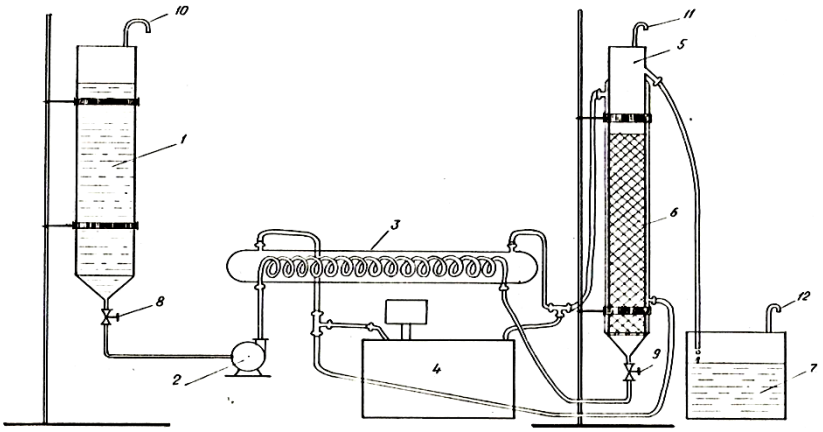

Fig1: Laboratory installation for selective refining the cotton oil (or miscell) in stationary layer of the adsorbents in dynamic conditions.

1-storage tank, 2-pump, 3-heater ,4- laboratory thermostat, 5-adsorber, 6-8-9–cranes, 10-11,12- lines of conducting the steam air mixture.

The temperature regime in heater 3 and the adsorber 5 is regulated by laboratory thermostat 4. Separation of the refined oil (or miscell) in the storage tank 1, in the adsorber 5 is regulated by cranes 8 and 9. Lines 10, 11 and 12 serve as diversion of steam air mixture, forming in the experiment. This installation is intended for getting the leading indexes, characterizing sorbents in dynamic conditions.

ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

Vol. 5, Issue 4 , April 2018

Much component property of the cotton miscell and oils require to work out effective methods of their refinement, especially before the stage of hydrogenization and feather etherification.Existing of the methods of ennobling the cotton miscell and oil is not enough perfect, as they don't meet the requirement for their refinement. Adsorption refinement of the cotton oil or miscell is one of perspective methods of refining them, as permits to extract selectively from their them undesirable admixtures [20]. In practice the application of chilling process of cotton oil by clay and coal is carried out in the periodic regime of using labour-consuming operations of the oil filtration. Besides that, passing the small part of adsorbents into the content of the refined oil makes the next stage difficult to treat.

This rational connection is to ennoble the refined miscell and cotton oil in stationary layer of the adsorbent that it is fortunately combined with the hydrogenization in the stationary catalysts.While adsorbing polar sorbents, polar molecules are adsorbed better from unpolar solvent. Thus, application of zeolits $R_2{}^1R)OA\ I_2O_3SiO_2oH_2O$ having molecular-sieve properties permits to selectively remove harmful things, containing both the oil and the solvent.We studied the possibility of applying synthetic zeolitsNaX and CaX with different binders for selective ennobling the refined miscell and cotton oil. By this method of DTAwe exposed the best regimes of thermal drying and activation. The obtained results are presented in Table 1.

Tabel 1. The results of DTA in research patterns of zeolits

Mark of zeolits	Forms of zeolits	Temperature I, II and III of endothermic effect, °C		
		I- effect	II--effect	III- effect **)
CaX (kaolinit)*)	granule	230	280	910
CaX (bentonit)	changedgranule	235	285	915
NaX(kaolinit)	changedgranule	235	290	920
NaX(cement)	granule	240	300	930

*) the type of binding things of zeolite; **) Inadmissible temperature of zeolit regeneration

As shown in Table 1, the temperature of drying and activation of zeolits is expediently kept in 350-400°C. Thus in this condition is wholly reduced its adsorption properties. Synthetic zeolitsNaX and CaX adsorb those things which the critical diameter is less than the effective diameter of the pore. For CaX the effective diameter of the pore consist of 8-10 Å, and for NaX 9-13 Å.

Dataset Description

The process of refinement of plant oils and fats is called to ennoble the contents in their triassilglycerin's. But, in the existing schemes of refinement of the cotton oil aren't always achieved the deep removal of the attendant things, having toxic nature. Their presence in the hydrogenising means abruptly decreases the activity and stability of the applied catalyst. They also affect to the quality of the received hydrogenisate. Solving these problems requires an individual studying each component of things, attendant to plant oil, and their influence to the hydrogenising process of triassilglycerin's.

V. EXPERIMENTALRESULTS

Adsorption refining process of cotton miscells in stationary layer of zeolits was conducted in the columned mounting at temperature 60°C, the ratio of layer height of the adsorbent is 8 to the diameter and the velocity of introducing raw materials is 0,4 sm/second. Selective ennobling belonged to the refined cotton miscell (Table 2) and oil (Table 4).

ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

Vol. 5, Issue 4 , April 2018

Table2. Changing of the indexes of the refined cotton miscell before and after selective ennobling of zeolits

Types of miscells	Indexes of the refined cotton miscell					
	Acid number, mg KOH	Color	Containing phosphates,%	Containing the whole *) gossypol, %	Peroxidenumber ,% J_2	Containing soap, %
ZeolitCaX (binding thing – kaolinit)						
Before refining	0,4	13,0	0,06	0,08	0,025	0,002
After refining	0,2	8,0	0,00	0,00	0,010	absent.
Zeolit NaX (binding thing– kaolinit)						
Before refining	0,5	14,0	0,08	0,09	0,030	0,003
After refining	0,3	6,0	0,00	0,00	0,010	absent
Zeolit NaX (binding thing– –cement)						
Before refining	0,4	13,0	0,08	0,09	0,088	0,002
After refining	0,3	10,0	0,00	0,00	0,009	absent

*)Totals of native, changeable and binding gossypol

As shown in Table 2, the largest effect is observed in NaX with the binding substance kaolinit where the acid number falls to 0,2 mg KOH colour 8 red units peroxide number to 0,01% and the soap of the produced gossypol practically zero. Changing of binding kaolinit to cement results in increasing the colour of the oil. The analogous are observed in changes of kation of zeolite Na to Ca. For the amount appraisal of refining the miscell by zeolits we used the spectral method of comparison of areas (Fig 2).For this the visible region of the light was divided into two parts AB and BD where attendant substances of the oil reveal[21].

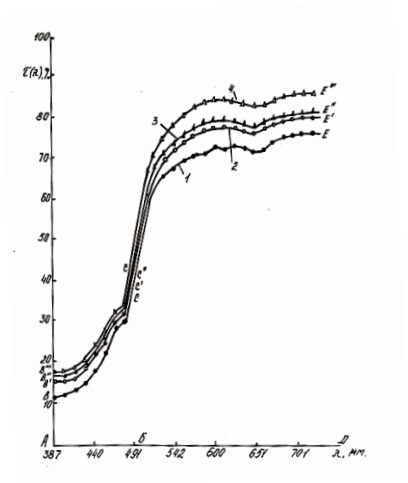

Fig: 2. Dependence of changing the coefficient of missing the cotton miscell from the length of apparent neon waves and natures of the adsorbent, applied in refining it.

1-ordinary miscell (control);
2-miscella refined by zeolitCaX (binding substance kaolinit)
3-miscella refined by zeolitNaX (binding substance cement)
4-miscella, refined by zeolit marks NaX (binding substance kaolinit).

Results of the spectral processing are presented in Table 3.

Table:3. The degree appraisal of cleaning the refined cotton miscell, depending on the nature of the adsorbent

Forms of miscella	Area	The weight of the area	Degree of refinement
By gossypol, carotenoidand their derivatives			
Miscella which is not refined	ABCV	0,0576	-
Miscella refined by CaX (binding substance kaolinit)	$ABC^{I}VI$	0,0720	$\frac{ABV^{I}C^{I}}{ABCV}=1{,}2500$
Miscella refined by Na X (binding substance cement)	$ABC^{II}V^{II}$	0,0791	$\frac{ABC^{II}V^{II}}{ABCV}=1{,}3732$
Miscella refined by Na X (binding substance kaolinit)	$ABC^{III}V^{III}$	0,0863	$\frac{ABC^{III}V^{III}}{ABCV}=1{,}4982$
By chlorophyll, pheophitin and others			

ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

Vol. 5, Issue 4 , April 2018

Miscella which is not refined	BDEC	0,5307	-
Miscella refined by CaX (binding substance kaolinit)	$BDE^{I}C^{I}$	0,5480	$\frac{BDE^{I}C^{I}}{BDEC}=1,0344$
Miscella refined by Na X (binding substance cement)	$BDE^{II}C^{II}$	0,5553	$\frac{BDE^{II}C^{II}}{BDEC}=1,0463$
Miscella refined by Na X (binding substance kaolinit)	$BDE^{II}C^{IIII}$	0,5947	$\frac{BDE^{III}C^{III}}{BFDEC}=1,1205$

The presented results show that the largest effect lighted by gossypol, carotenoidand their derivatives reach to the synthetic zeolitNaX (binding substance kaolinit).Zeolitwith binding substance-cement, the degree of refinement be these substances is-1,3732, and for zeolitCaX with the binding substance kaolinit-1,2500. The degree of refining these sorbents by attendant substances is less in groups of chlorophyll. For example CaX(binding substance kaolinit) cleans the refined miscell from substances of group-chlorophyll-1,0344 times, NaX (binding substance cement)-1,0463 and NaX (binding substance kaolinit)-1,1205. These facts cannot thoroughly characterize the properties of the studied adsorbents but permit to determine their influence in the relation of the determined groups of the undesirable substances of the cotton oil that is very important for proper selection of the adsorbent [21].

Rational correlation of the length of zeolit layer is experimentally established to the diameter of the columned apparatus (H/d), which is equal to 7:8. The nature of the hydrocarbon solvent also affects the quality of the ennobled refined cotton miscell.Analogous results are received by ennobling the refined cotton oil by zeolitNaX (binding substance–kaolinit) in stationary conditions (Table 4).

Table 4. Changing the indexes of the refined oil before and after ennobling by zeolitNaX
(binding substance – kaolinit)

Physical and chemical indexes of the cotton oil	**Indexes of the refined cotton oil**	
	before refining	**after refining**
Colour, red while 35 yellow	14,0	8,0
Acid number, mg KOH	0,4	0,2
Contains of phosphatids, %	0,05	0,02
Containsof soap, %	0,006	res.
Contains of derivatives of gossypol.%	0,03	res.
Containsofmoisture,%	0,15	0,04
Peroxide number, % J_2	0,03	0,01
Fatty acid compound , %: -linol$_{18:2}$)	54,5	53,9
-olein ($C_{18:1}$)	18,0	18,0
-stearin($C_{18:0}$)	3,1	3,0
-palmitin($C_{16:0}$)	23,5	24,3
-palmitin –olein($C_{16:1}$)	0,9	0,8
Iodine number, J_2/100g	109,5	109,3

As shown in Table 4, ennobling refined cotton oil in the layer of granulatedzeolitNaX**(**binding substance – kaolinit) enables to reduce the contents of the attendant triassil glycerin substances, which negatively influence to the stability of the next process. In the fatty acid compound of the cotton oil, changes are observed by separate types of fatty acids, that influence their the possibility of the zeolits. The research showed applying zeolitsCaX or NaX in columned devices while ennobling the cotton oil and miscell by their repeated thermal regeneration. So, this process can byapplied both as refinement and hydrogenization production. The advantage of it is to preferzeolitNaX**(**binding substance – kaolinit).

ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

Vol. 5, Issue 4 , April 2018

VI. CONCLUSION AND FUTURE WORK

Conclusion: Working the processing technology of hydrogenising the refined cotton miscell with preliminary refining in stationary layer of synthetic zeolit, demands to conduct experienced plant trials in technological regimes, received in laboratory conditions. In this wary, it is necessary to aspire in carrying out the trials in conditions, closer to industry that is essential for project and application of recommended technologies.

Table 5. Indexes of the cotton miscellaoil before and after selective refining in stationary layer of zeolitNaX (the binding substance- kaolinit)

Forms ofmiscella	Color,red unitswhile 35yellow	Acid number, % KOH	Acid number, % KOH	Contains ofsoap,%	Contains ofgossypol and itsoterivatives, %	Iodine number, %J_2	Carotenoid, mg
Before refining	16	0,4	0,05	0,004	0,30	0,01	0,3
After refining	8	0,1	0,00	0,000	0,00	0,01	0,3

Selective refinement of 52% industrial refined miscell, obtained from cotton seeds, was carried out in columned adsorber in stationary layer of granulated synthetic zeolitNaX (the binding substance- kaolinit. Activation of the zeolit was accomplished in the stove, temperature 350-400°C for 4 hours and later cooling till 25-40°C, the concrete protions (1l)were loaded in the columned reactor. The miscell was feudedto the lower part of the column.The refined miscellahad iodine number 102,6% J on the oil and the next fatty acid content %): saturated acids -26,3; olein acid -20,1 linol acid -53,6%. The colour of the oil in the miscella was equal to 16 red units while 35 yellow in 13,5sm layer. The volume velocity of the feeding the miscella in the adsorber changed, depending on maximal extraction of the attendant substances of deactivatingcatalyst. Experiences were conducted at temperature 60°C.The obtained results are presented in table 5.As shown in Table 5 after processing the refined cotton miscella in stationary layer of synthetic zeolitNaX (the binding substance- kaolinit) is achieved essential improvement of its quality indexes, the colour reduces from 16 till 8 red units 75 yellow in 13,5sm layer; acid reduces till 0,1% KOH, and the contents of phosphatides soap, carotenoid, gossypol and its derivatives is broughtto 0. Increasing of peroxide number isn't observed.

REFERENCES

[1] Tyutyunnikov B.N.: Technology of conversion of fat// M.: Pishepromizdat, 1963, 595.[in Russian]
[2] Managament on methods of study, technical-chemical checking and account of production in oil fatty industry. L.: VNIJ, V.III, 1964,-494.[in Russian]
[3] Bezzubov L.P.: Chemistry fats. //M.: Food industry, 1975.- 280.[in Russian]
[4] Sokolskiy D.V., Jubanov K.A.: Hydrogenization vegetable fats.// Alma Ata: Science 1972.-181.[in Russian]
[5] Glushenkova A.I., Markman A.L.:Hydrogenization fats. //Tashkent: Fan, 1979.-144.[in Russian]
[6] Tovbin I.M., Melamud N.L., Sergeev A.G.:Hydrogenization fats.// M.: Light and food industry 1981.-195.[in Russian]
[7] Tyutyunnikov B.N., Naumenko P.V., Tovbin I.M., Faniev G.G.:.Technology of conversion fats. //M.: Food industry, 1970.-652.[in Russian]
[8] Rjexin V.P.: Gossipol and its derived. L.: VNIIJ, 1955, -40.
[9] KoritataSembasivasav.: Selective hydrogenation of soylean oil VIII Poisons and inhibitors for copper catalysts. " JAmer oil Chemsoi", 1975, № 7, c.240-243.
[10] Patent № 45218 (Ireland).Hydrogenation and purification of fats and oils. Petrolite Corp.
[11] Patent № 4683/77 (Australia).:UerfahrenzumBeingen liner gehartetenraffimierensubstans, Petrolite.Corp.
[12] Abdullaev N.SH., Majidov K.X., Abduraximov A., XakimovI.N.:Process Study adsorption refining and hydrogenation cotton oil on stationary catalyst./ /Patant №3351-80, 1980,- 7.[in Russian]
[13] Zinovev A.A.: Chemistry fats. //M.:Pishepromizdat, 1952.P.234. [in Russian]
[14] SHmidt A.A., Askinazi A.I., Gubman I.I., Levinson S.Z.: Adsorption refining of vegetable oil.//M.: CNIIITEpisheprom, 1975, -45.
[15] Grigorchuk R.T., Mironova A.N., TroskoU.I.:Nature of painted materials cotton oil and ways their removing.//M.:CNIITIEpisheprom, 1979, issue.7.-48.[in Russian]
[16] Managament on methods of study technical-chemical a checking and account of production in oilfatty industry.// L.: VNIIJ, t.1, 1967,-585.[in Russian]
[17] Management on technologies of getting and conversions vegetable oil and fats.//L.: VNIIJ, т.III, 1970, P.52.[in Russian]
[18] Novikova O.S., Adlova T.T., RyabovaN.D.:Use given is differential-termal analysis for the feature mineral adsorbents.//-Uzbek chemical journal, 1964, № 4, -43-46.[in Russian]
[19] Zeolits and their using.//Kiev, 1971, 57.[in Russian]
[20] Author's certificate. №737436 (USSR).Way an hydrogenation vegetable oil and fat/ Raemskaya N.P., Filimonova Z.V., Gorenshteyn B.M.., and others.// Published in bulletin of inventions.-1980. №7.[in Russian]
[21] S.A.Abduraximov, S.B. Baxtiyarov, Z.S.Salimov, B.X.Latipov, G.U.Tillaeva.: Evaluation degrees of осветления oil and selectivity adsorbents to the accompanying triassilglycerines materials.// Uzbek chemical journal.-1998, № 1.- c.66-69.[in Russian]

ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

Vol. 5, Issue 4 , April 2018

[22] Abduraximov S., Baxtiyarov S., Suvanova F., Tillaeva G., Salimov Z., Alimov A., Salidjanova V., Abduraxmonova A..: Quality Increasing food cotton oils by the method their adsorption peelings on actuate local clays.// Innovaciya-98. Thesises of reports. Scientifically-practical conference.-Fergana, 1998.-c.21-22.[in Russian]