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The Role of Ionic Liquid-Morpholine formiate as an extragent in selective treatment of 260-340^{0}C fraction of therapeutic Naphthalane oil

Pervane Movsumova[1]

[1]*Department of chemical reagents for oil and gas extraction and processing industries, Institute of Petrochemical Processes named after Yu. H. Mammadaliev, National Academy of Sciences of Azerbaijan*

Abstract-*In order to improve the medicinal properties of 260-340^{0}C fraction of Naphthalane oil (NO), its selective treatment was realized using extractive method. For this purpose, in this article we presented results of our investigations. In this purpose was used Morpholine formiate (IL). Our main aim was to remove harmful and toxic components-sulphur and mono- and polynuclear aromatic hydrocarbons, which possess carcinogenic properties, from NO fraction. Investigations were conducted at 40-90^{0}C, 2-4 stages, 1:2-1:4 ratios. The contact duration of each stage was 30 min. From researches, carried out with using of IL, it was revealed that the amount of same components decreased to minimum. As, initial and obtained raffinates were determined with standart methods. For the purpose of detection of residual aromatic hydrocarbons in the composition of initial and obtained raffinates, sulphurization method was realized and it was detrmined that the amount of aromatic hydrocarbons was 3,23% as against 18.5%. The amount of sulphur decreased from 0.0354% to 0.0204%. Moreover, this raffinate was determined by UV- and IR-spectroscopic analysis.*

Keywords-*naphthalane oil, extraction, ione liquids, selective treatment, raffinate, carcinogenic coumpound*

I. INTRODUCTION

Now, the development and industry applying of non-polluting and wasteless technologies one of the perspective directions in chemical industry.

But, in ecological-economical terms of development of advantageous technology for treating of naphthalane oil from carcinogenic compounds-aromatic hydrocarbons, which are reduce its nedicinal properties, still one of the actual problems of oil-chemistry.

For centuries, people used naphthalane oil in natural form for therapy of varios diseases [1]. As, under leadership of Y.H.Mammadaliev, the physico-chemical and structure-group compositions of oil was studied, also the mix of polynuclear naphthene hydrocarbons were obtained with removing of water, asphaltenes, resins and natural oil acids from oil [2]. For this reason, till now days on purpose for improvement its medicinal properties, many researches have been done in this direction. Medical researches show that, naphthene hydrocarbons, treated from components noted above, has strong medicinal influence and are not affect negatively. Rely on all these, world-famed scientist, academician Y.H. Mammadaliev for the first time suggested an idea about the relation among medicinal influence mechanism of oil and its polynuclear naphthene hydrocarbons. In 1961-1965 years, these investigations were done by R.M. Babaev under the leadership of H.Hashimov in the Institute of Petrochemical Processes, but in 1965-1992 years by A.N.Muradov under leadership of academician A.M. Guliyev in the Institute of Chemical Additives [3].Moreover, under the guidance of correspondent member of ANAS F.İ. Samadova and academician V.M.Abbasov, large scale researches have been done in the field of investigation of napthalane oil's structure-group composition. Since, as a result of these studies, the treating technologies were developed, for purifying of medicinal napthalane oil from aromatic hydrocarbons, resin compounds using acid-contact, hydrogenation and hydrorefining methods [4-7].

However, the processes requiring the use of many solvents, adsorbents, acid, high pressure, is not efficient ecological and economically and there is not use area of wastes produced from purification processes in industry.

As, according to analysis of late literatures,for treating of oil products it is to use morpholinformiate, it can be regenerated and used repeatedly [8-11]. From this point of view, conducted investigations intended for development of ecological and economically efficient, wasteless treatment method for oil refining industry.

II. MATERIAL AND METHODS

For this purpose, IL was used as an extragent in selective treatment of 260-340^{0}C fraction of NO.
260-340^{0}C fraction of NO was used as a feedstock and its physico-chemical properties have been determined via modern standart methods (Table 1).

Initial raw material and raffinates, obtained at optimal conditions, have been determined using UV- and IR-spectral analysis.

UV-specrtal analysis carried out by UV 6850 UV/Vis (Jenway) spectrometer, 190-350 nm spectral range and at room temperature. The samples spectra have been taken in different concentrations (c1-10.75g/ml, c2-2.52 g/ml, c3 - 0.40 g/ml) quartz bathtubs of 1.9 cm thickness.Amount of benzene derivatives and polycyclic aromatic hydrocarbons was determined with the help of isooctane solvent and by method taken from [12].

IR-spectral analysis were done at 600-4000 sm^{-1}wave number range, by ALPHA IR-Furye spectrometer of company BRUKER (Germany).

Table 1. Physico-chemical properties of naphthalane oil fractions

Properties of 260-340^{0}C fraction		Test methods by ASTMD
Density at 20^{0}C, kg/m^3	891.4	5002
Freezing temperature, ^{0}C	-60	97
Kinematic viscosity, mm^2/s: at 40^{0}C at 100^{0}C	 5.2256 1.6601	445
Ignition temperature, ^{0}C (in close plate)	92	92
Coefficient n_D^{20}	1.4870	5006
Amount of sulphur, %(wt.)	0.0354	19121-73
		Test methodsby Federal Standart
Fraction composition^{0}C: o.p. e.b.p.	 260 340	2177-99
Colour	5+	20284-74
Amount of aromatic hydrocarbons, by sulfurization method,%	18.86	6994-74

III. RESULTS AND DISCUSSION

Selective treatment of 260-340^{0}C fraction of NO was conducted at 40-90^{0}C, 1:2-1:4 ratios, 2-4 stages, using IL as a solvent. Obtained results were shown in table 2.

Table 2. Step treatment of 260-340^{0}C fraction of naphthalane oil with IL at 40-90^{0}C (the contact time for each stage was 30 min.)

Weight proportions (NN:NMP)	T^{0}C	Number of stages	Yield of extract, % (weight)	Raffinate's datas					
				Yield, %, (weight)	kg/m^3	n_D^{20}	Amount of sulphur,%	Colour	Amount of aromatic hydrocarbons %, by sulfurization method
Initial	-	-	-	-	891,4	1,4870	0,0354	5,0	18
1:2	40	2	8,10	91,9	876,3	1,4789	0,0331	2,25	12
	60		13,80	86,20	876,0	1,4783	0,0301	1,75	8
	80		16,70	84,30	875,9	1,4787	0,0289	1,75	10
	90		22,34	77,66	875,9	1,4756	0,0219	1,75	8
1:3	40	3	12,4	87,6	876,0	1,4783	0,0299	2	10
	60		17,9	82,1	875,7	1,4774	0,0255	2	5
	80		23,38	86,62	875,9	1,4779	0,0238	2	7
	90		31,80	68,20	875,9	1,4756	0,0187	1,75	8
1:4	40	4	15,8	84,2	876,0	1,4779	0,0267	1,75	7
	60		25,7	74,3	875,5	1,4769	0,0204	1,0	2
	80		30,15	69,85	875,9	1,4779	0,0185	1,25	7
	90		37,91	62,09	875,9	1,4771	0,0145	1,25	6

Rely on Table 2, with increasing of number of stages the yield of extract increases, too. Simultaneously, coefficient n_D^{20} of obtained raffinates reduces (from 1.4870 to 1.4769) sharply in comparison to raw material. This indicates decreasing of amount of aromatic hydrocarbons. Colour datas reduced from 2,25 to 1 as against 5. From table it is clear that, for determining of relative amount of aromatic hydrocarbons in obtained raffinates, first of all sulfurization method was realized. As seems, aromatic hydrocarbons were decreasing in 60^0C, 1:4, 4 stages in relation other raffinates. In these stage amount of sulphur (from 0.0354 to 0.0204%) decreasing with increasing of number of stages. For this purpose, the UV-, and IR-spectra of raffinate (1:4 ratio) obtained at optimal condition, were depicted. The UV- and IR-spectra of raffinate, obtained from treating of 260-340^{0}C fraction of NO with IL, are shown in Figure 1 and 2. According to UV method, amount of aromatic hydrocarbons was 3,23%.

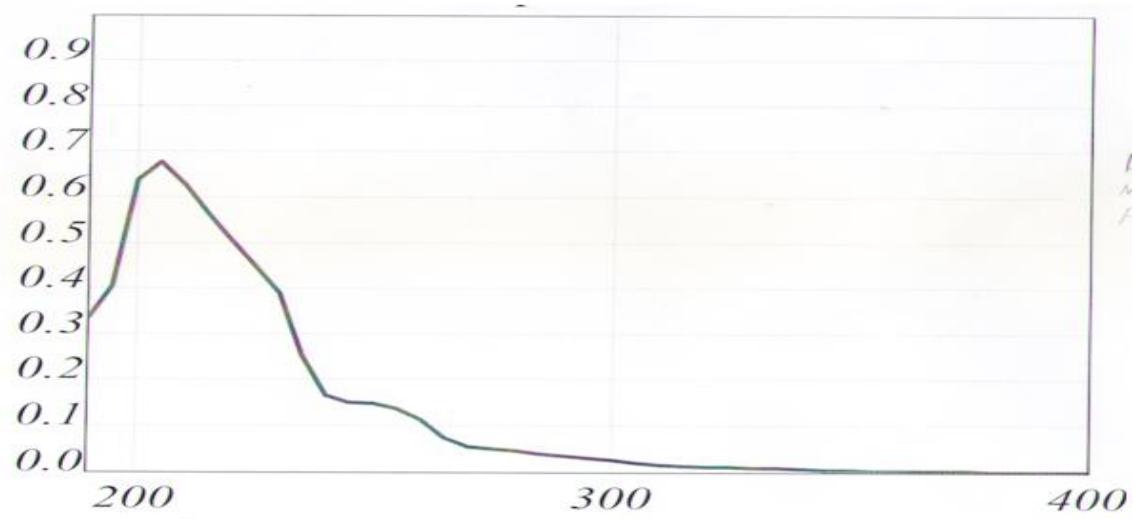

Fig 1. UV-spectrum of raffinate, obtained at 60^0C , 1:4 ration from naphthalan fraction

According to UV-spectrum,the structure-group datas of aromatic hydrocarbons are such: Benzene derivatives-1,88%, naphthalines-0.77%, phenantrenes-0.37%, benzofluoerenes-0.0009%, chyrezenes-0.1304%, anthracenes-0.0264%, 1,2-benzaanthracenes-0.0523%

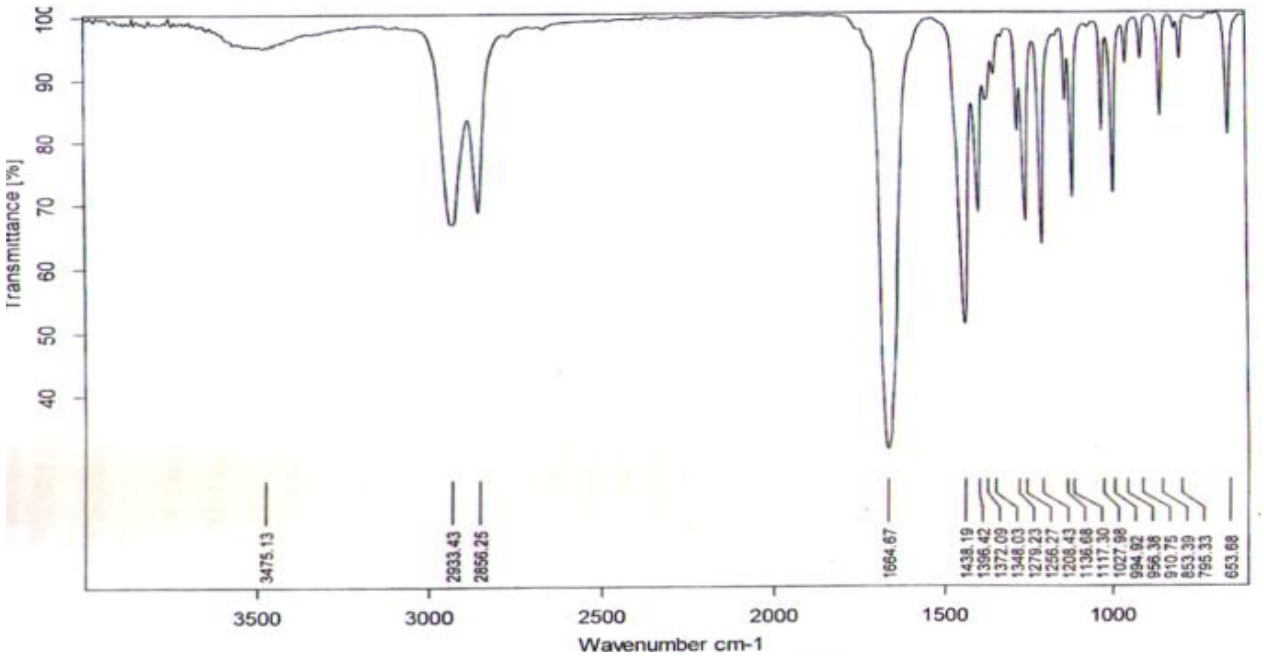

Fig 2. IR-spectrum of raffinate, obtained at 60^0C, 1:4 ratio from naphthalan fraction

According to fig.2, 725sm^{-1} shows the mathematical dance of C-H bond of CH_2-group; 1348, 1438 sm^{-1}-deformation dance of C-H bond of CH_3 və -CH_2 groups; 2856, 2933, 2950sm^{-1} valence dance of C-H bond of -CH_3 və -

CH_2 groups; 968sm^{-1} –shows the C-H bond of naphthene hydrocarbons; and 795, 853, 1664 sm^{-1} show C-H and C=C bonds of aromatic hydrocarbons.

It seems that, in the composition of raffinate, only treated at 60^0C temperature, 1:4, 4 stages the minimum amount of aromatic hydrocarbons, which are carcinogen compounds, was about 3,23% (by method of UV).

IV. CONCLUSION

As a conclusion, we can say that the IL-morpholineformiate is less efficient as the selective solvent in comparison to with N-methy-2-pyrrolidone [13] in purification of treatment Naphtalane oil fractions. But it can be considered that as an extragent morpholineformiate has higher purification degree as compared to other ILs [14].

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