Extraction of aromatic hydrocarbons from secondary products of the pyrolysis process

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Annotation: *in this research work, substances were isolated from the composition as a result of vacuum distillation of tar product formed in pyrolysis process and the substances obtained were studied using physico-chemical research methods, anthracene was isolated from multi-ring aromatic hydrocarbons and the content of the obtained anthracene was studied using IR spectroscopy. For the purpose of comparing the separated anthracene with IR spektorscopy, both IR spectroscopy of pure anthracene obtained as a benchmark were obtained and compared.*

Keywords: *pyrolysis process, tar product, arene, anthracene, phenanthrene, fluorine.*

Today, the use of local raw materials in the synthesis of substances, especially the production of industrial waste, the separation of substances from the composition of which is important for the industry, is considered an urgent task. Joint venture of one of the giant industrial enterprises of the Republic "Uz-

KorGas Chemical" Limited Liability Company is based on natural gas processing. The total annual production capacity of the complex is 387 thousand tons of polyethylene and 83 thousand tons of polypropylene. In addition, more than 102 thousand tons of pyrolysis distillation, 8 thousand tons of pyrolysis oil and 10 thousand tons of heavy pyrolysis scale "tarmakhsulot"are formed in the process. Pyrolysis oil, pyrolysis oil and tar-have a negative impact on ecology due to the fact that the product is almost not processed. The processing of these factions at this enterprise is not provided for in the project.

Heavy pyrolysis resin is an oily liquid from dark brown to dark green in color with an unpleasant odor. Tar is a black, odorless substance. The compositions of the products are not stable and depend on the pyrolysis raw materials. Pyrolysis distillate contains mainly arenes and olefins with a carbon number of 6-12. The content of olefins is 23.7%, arenes 67.18%. Alkanes, dienes, cycloalkanes are also present.

Heavy pyrolysis resin contains mainly naphthalene 41.51%, 2-methylnaphthalene 16.25%, as well as indene - 9.33%, 1-methylnaphthalene and 1,6-dimethylnaphthalene. Quantitative and qualitative analysis showed a 90-97% coincidence of the spectrograms of the resin components with the database of the Nicolet 6700 IR Fourier Spectrometer with Continuum microscope and Raman module.

The process of thermal pyrolysis of hydrocarbon raw materials (oil and its fractions) is the main method for producing low–molecular unsaturated hydrocarbons -olefins (alkenes) –ethylene and propylene. Along with the production of ethylene and propylene, the process of pyrolysis of oil.

It should be noted that when studying the composition of the tar product, it was found that the composition contained anthracene,naphthalene, phenanthrene, fluorines and, in addition, indene, ftalangidine and other valuable chemical products necessary for the industry from multi-ring aromatic hydrocarbons.

The tar product is a black odorless solid. The composition is not stable and depends on the pyrolysis raw materials. Samples of the TAR product of the joint venture UzKor Gas Chemical LLC for preliminary determination of the qualitative composition were analyzed on a Nicolet 6700 IR Fourier spectrometer analyzer with a Continuum microscope and a Raman module. The results of the analysis are shown in Figure 1.

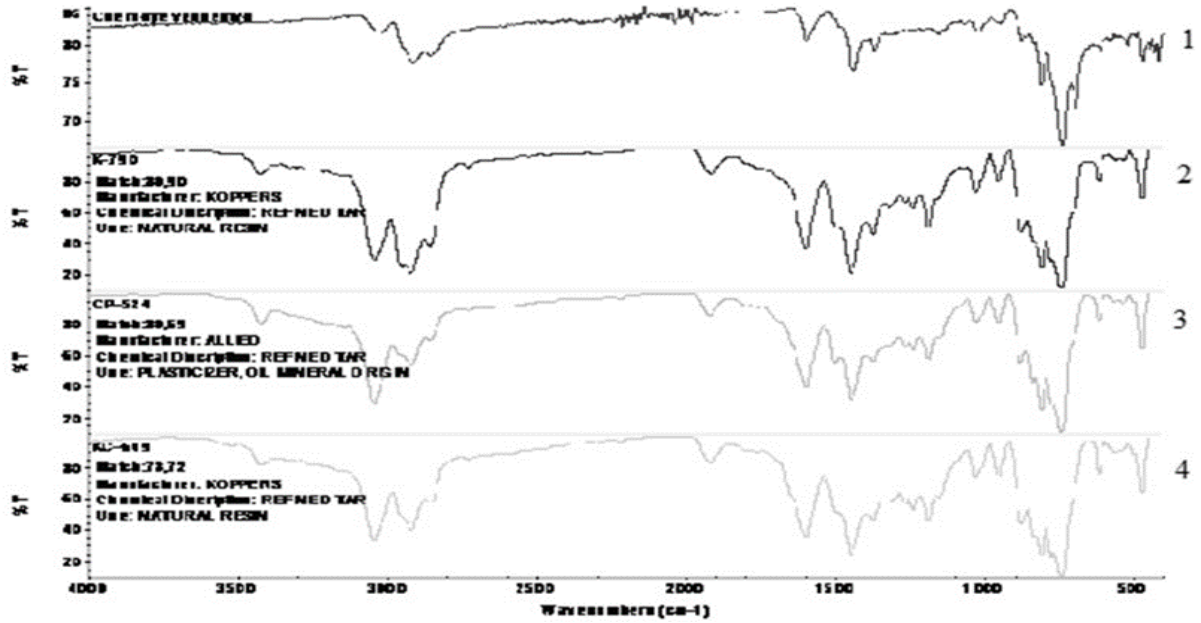
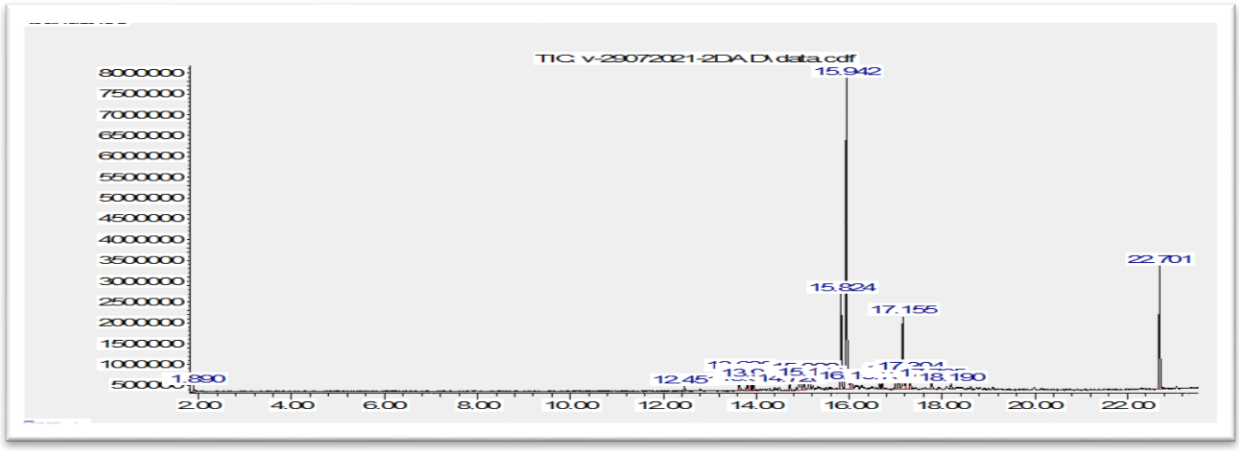


Figure 1. IR spectrogram of the TAR product: 1 - tar product, 2, 3 and 4 spectra of the base of the device

In the study, the composition of "tar-product", which is considered a secondary raw material, was studied by vacuum fractional driving at high temperature, and the products obtained were physico-chemical analysis.



2-picture.Mass-spectrum alanalization of the fraction obtained as a result of vacuum driving of Tar-product

The results of Mass-spectrum alanalization show that in the composition of the resulting fraction there are several substances that are valuable for the industry.

Table 1

Results of vacuum driving of Tar-products

№	Substance name	Output time (min)	Percentage of component(%)
1	Fluorene	13,63	2,17
2	2-phenyltaloal	13,94	1,38
3	9-methylfloren	14,95	2,86
4	2-methylfloren	15,02	1,86
5	1,1-diphenyleten	15,14	1,88
6	fenantren	15,82	10,44
7	2-methylphenanthren	15,94	38,64
8	4-methylphenanthren	16,71	1,02
9	3-methylphenanthren	17,01	1,4
10	2-methylantratsen	17,07	1,79
11	1-methylantratsen	17,16	8,69
12	9-methylantratsen	17,26	2,7
13	2-methylantratsen	17,30	2,09
14	1,4-methanoazoline	17,77	1,37
15	1,2-benzendicarbon acid	22,70	13,46
16	unspecified product	>22,70	9,25

In the study, anthracene and its homologues were separated from the tar product and its composition was studied. In order to distinguish anthracene from the composition of the Tar product, the tar product was expelled in the device equipped with a reversible refrigerator, vacuum pump, thermometer, collector

tube with a volume of 2 l. In the Bunda, the temperature of the vapor of the substance rose to 4000 C. The resulting fractions were again driven into fractions depending on the temperature again. The following fractions were separated:

1-Fraction 50-160^0 C

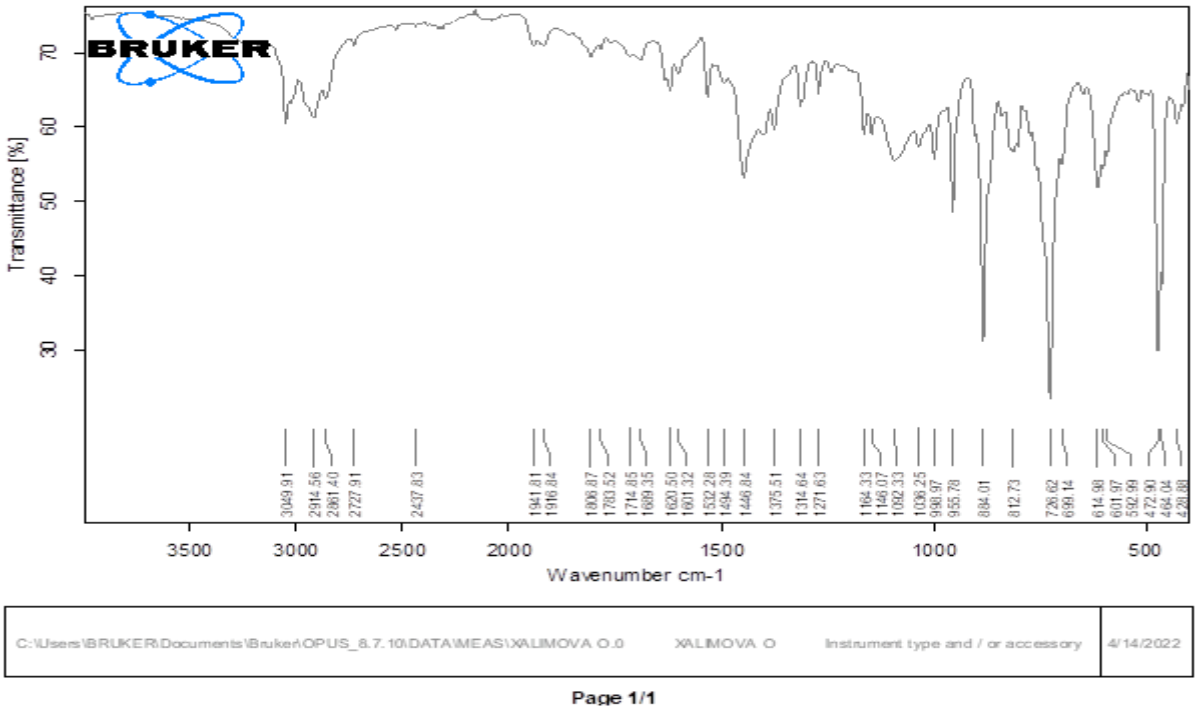
2-Fraction 160-180^{0}C

3-Fraction180-200^{0}C

4-Fraction 200-300^{0}C

5-Fraction 300-360^{0}C

When the 5-th fraction was harvested and cooled to 0^0 C, crystals of anthracene were formed.In this fraction Byuxner funnel, the vacuum pump was filtered in the connected position. The filter was separated from the paper by a substance and initially dried in the open air, and then in the drying cabinet at 2 C for 140^0 hours. The composition of the dried substance was checked by the ik-spectroscopy method.

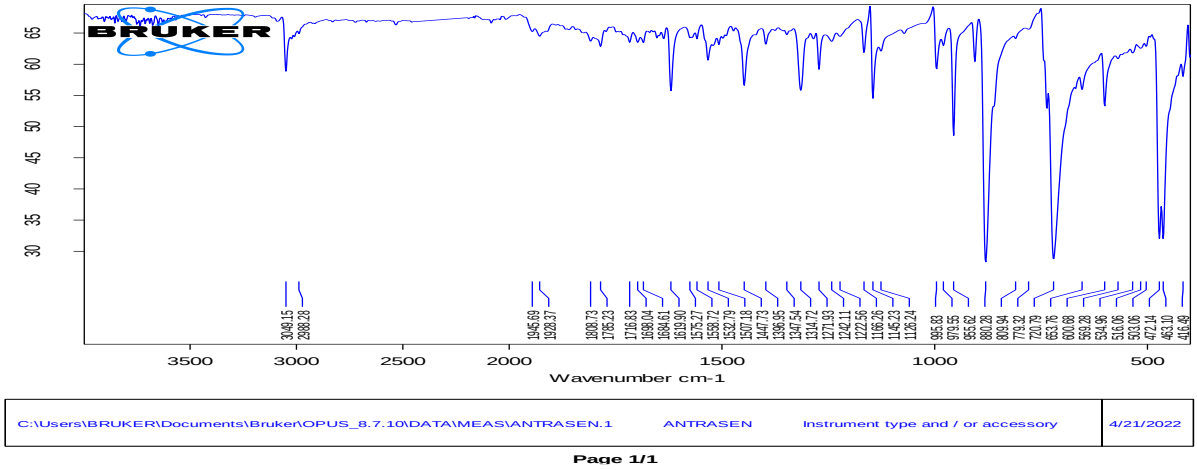


3-picture. IR-spectroscopy of anthracene and its homologues

As can be seen from infrared spectroscopy, multi-ring aromatic hydrocarbons form special absorption lines in the area of 1600-3000 cm^{-1}, similar to benzene. Also important for these compounds is the absorption range 600-900 cm^{-1}. In the infrared spectroscopy described in Figure 2, 3049,91 cm^{-1} represents

the vibration of the Sar-N Garden in the absorption area. 1620,50 cm^{-1}, 1601,32 cm^{-1}, 1532,28 cm^{-1}, 1494,34 cm^{-1} absorption Sphere S=s garden vibration, 1446,84 cm^{-1} absorption sphere-typical vibration for SN2 fasteners, 1375,51 cm^{-1}, 1314,64 cm^{-1}, 1271,63 cm^{-1} absorption sphere =SN garden deformation vibration, 1164,33 cm^{-1}, 1146,07 CM^{-1},1092,33 cm^{-1}, 1036,25 cm^{-1} absorption sphere SAR-N represents the vibration of the garden, 699,14 cm^{-1}, 614,98 cm^{-1}, 601,97 cm^{-1} the vibration of the tripod. {2}

As can be seen from the infrared spectroscopy 2-th picture, it is confirmed that the 5-th fraction is rich in multi-folk aromatic hydrocarbons, especially in its composition there are anthracene, fenanthrene, fluorine and its homologues.



4-picture. IR spectrum of ethalon antracene

For the purpose of comparison with the separated anthracene, the infrared spectrum of pure anthracene, obtained as a benchmark, was also obtained. The peculiarity of the spectra of complex aromatic ring compounds is that the value and number of frequencies in the field 600-900 cm^{-1} depends on how many benzene rings are in the condensed aromatic ring.From the infrared spectra it can be seen that with pure anthracene, the infrared spectra of anthracene and its homologues, separated from the tar product contents, are similar, almost identical to the absorbent spheres found in the molecule-containing bonds. The analysis of the results shows that the composition of the fraction obtained as a result of vacuum driving of tar-products consists mainly of aromatic multi-folk organic substances. The targeted use of Tar products in the separation of components and

obtaining from them a variety of products for the industry is effective both economically and from an environmental point of view.

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