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SUBJECT INDEX AND REPORT

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REPORT ON

UNITED STATES TECHNICAL OIL

MISSION MICROFILM REEL 82

Compiled and Edited

by

Technical Information Section

UNITED STATES TECHNICAL OIL

MISSION MICROFILM REEL 82

Compiled and Edited

57

by

Technical Information Section

S U M M A R Y

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Items of interest in this reel are concerned with the Raman spectra of olefins in cracked distillates, proposals for refining Hungarian crude oil, research work on paraffin oxidation and corrosion prevention in distillation equipment.

Albert E. Miller, Chairman
API-TOM Study Group

NOV 27 1946

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RESEARCH ON HYDROCARBONS
NIENBURG; MAY 13, 1945

4968

Frames 4958-4973

Translation

1. Oxidation of Paraffin

The oxidation of paraffin was carried through by us, in order to prepare emulsions on the one hand and on the other hand a softening material for I. G. wax and mountain wax, which could no longer completely satisfy the increasing demand for wax acids caused by the deficit in natural waxes.

The starting material for the experiments was RB-hard wax with a melting point of 30°C, table paraffin with a melting point of 50-52°C and to a slight extent also soft wax. Since, however, the especially high-molecular-weight acids were prepared only from RE-hard wax, the experiments were carried through with the other two materials only to a slight extent, and the RE-hard wax was preferred as a starting material.

The first experiments were carried through with a mixture of sodium bichromate and sulfuric acid, an oxidation material. We were able, through repeated treatment at temperatures between 100-105°, to convert hard paraffin to a certain extent into fatty acids with mixtures of bichromate and sulfuric acid. The yield, however, was unsatisfactory. The acid number obtained in the case of five-fold oxidation amounted to only 35.

Better results are obtained, if one chlorinates the paraffin at first up to a chlorine content of about 5-6 per cent, then splitting off the chlorine by means of a thermal treatment at 350°C and subjecting the olefin mixture formed to oxidation with chromosulfuric acid, in the same manner as was carried out with paraffin. One obtains, thereby, with only two-fold oxidation, an acid number between 80 and 90. The paraffin was, in this case, about 50 per cent transformed into acid. By oxidation with chromosulfuric acid, there forms, from the bichromate, chromium sulfate, which by means of anodic oxidation is again converted into bichromate. 4969

Since, however, the equipment necessary for anodic oxidation of chromium is difficult to supply, a different method of paraffin oxidation was investigated. With the help of oxidation by a solution of nitrosylsulfuric acid, satisfactory results are obtained. The nitrogen dioxide, which accumulates from ammonia oxidation, can be used either pure or in a concentration of 8-9 per cent.

The oxidation is carried out in the following way: 75 g of paraffin are melted in a large heated container. Under constant stirring and passage of the solution of nitrosylsulfuric acid, 15 l of the acid are introduced. After 10 hours of passage, of the acid solution, the process is interrupted and the reaction material discharged. After separating the nitrosylsulfuric, washing the acid residue remaining in the reaction material and drying, there remains 70-71 kg of crude acid with an acid number of 70-72. This crude acid, called OP 3, contains about 50 per cent paraffin.

For the preparation of pure acid, the crude is saponified with high percentage alkali liquor, the soap which forms is dried and crushed, and the unchanged paraffin is removed by extraction with a benzine fraction boiling at 90°C. Since the paraffin obtained by extraction practically corresponds to the initial material, it can be added again to the oxidation. We were able to prepare from 100 kg of paraffin about 80 kg of pure acid with an acid number of 110-150. The pure acid contains about 0.5 per cent nitrogen. The initial material produced no uniform product, but had an average carbon number of 40-45, corresponding to a molecular weight of 600. The pure acid melts at 80-85°C.

By means of partial saponification, we succeeded in producing good, 4970 effective emulsifications, which made it possible to obtain solid and semi-solid emulsions. Benzine, diesel oil and paraffin can also be emulsified with water, in addition to oil. Fields of application for emulsions are, for example as a saponified shoe protective agent or a saponified floor protective agent, emulsion lubricating fat, and boring grease. Some of the products can also be produced with the crude fatty acids, as the above mentioned OP 3.

After a bleaching of OP 3, which can be carried out through a mild oxidation by means of a mixture of dichromate and sulfuric acids, one obtains an almost white product, which can be used in producing film-like emulsions.

2. Chlorination of Paraffin

As in the oxidation of paraffin already briefly mentioned, there is an intermediate stage of oxidation with bichromate-sulfuric acid, the chlorinated hard-paraffin, which is easily produced by a thermal chlorination a little above its melting point. In further pursuit of this experiment it was ascertained that also low-molecular-weight paraffins, for example, soft paraffins, are converted into chlorine paraffin by means of a thermal chlorination. This initial material is necessary in order to obtain as final products, lubricating oil, with special characteristics, and boring greases.

For these experiments the initial material was a synthetic paraffin with a melting point between 300 and 400°C, corresponding to C₁₇-C₂₄, or 300 and 450°C, corresponding to C₁₇-C₂₇, whereby the melting point of the product-mixture lies at 30-35°C. This soft paraffin was treated with gaseous chlorine at 100°C accompanied by stirring, until the chlorine content amounted to about 26 per cent; then the process was interrupted and the chlorine split off again. This chlorine splitting could be carried out either by the charge method thermally at 350°C, or in continuous operation through conduction of the chlorine-containing material over catalysts of certain composition. Especially approved have been materials containing SiO₂ and Al₂O₃. A special characteristic of all the catalysts used is a definite sintering, 4971 which is reached by a pre-heating to about 1000°C.

From such materials one obtained, in the case of conducting the chlorine-containing products over a catalyst, olefin mixtures with extraordinarily high iodine numbers. The olefin mixture obtained by chlorination and dechlorination corresponded in its molecular structure to the originally used paraffin. Cracking and polymerization was kept within very limited boundaries, if the dechlorination was carried through accordingly.

These olefin mixtures can be converted either by polymerization with aluminum chloride into lubricating oils, whose viscosity at 50°C is above 50° E and possesses a viscosity pole-height of about 1.6 (viscosity index is not determined, but lies above 100); or one can, through sulfonation with concentrated sulfuric acid and neutralization arrive at sulfonates, which form excellent drilling greases. The drilling grease experiments are first to be run. The reaction procedure is as follows: sulfonation, neutralization, removal of unsaponifiable material, dry-

ing. The liquid sulfonates formed are oil- and water-soluble and yield stable emulsions, capable of such dilution.

3. Investigations on Benzine

(a) Refining of benzine. In the magazine Ol and Kohle, 1941, page 143, there is an article by me under the title "Working Methods in the Primary Production of Synthetic Processes and Their Use in Petroleum Manufacture," in which is reported a process to increase the octane number of olefin-containing benzines by catalytic treatment, which is carried through essentially without material waste. The benzines are conducted at increased temperature, however, still under the splitting temperature, over a Fuller's earth catalyst, which has the characteristic to react isomerically. In addition to a slight isomerization, which leads to a branching in the olefin, the double bonds from the end of the molecule to the center are removed, whereby the octane number can be increased considerably.

For example, in the case of cracked benzine from synthetic products, an octane-number increase of 10-20 points can be reached, depending upon the olefin content of the initial material. Also in the case of cracked benzine from petroleum, octane increases of 5-6 are obtained.

(b) Behavior of primary benzine in storage. Further investigations concern the storage stability of primary benzine and cracked benzine from primary products, in which case an increase of the peroxide content is to be chiefly observed, except that gum formation occurs. By means of the addition of an inhibitor the change can be prevented. A publication of mine concerning this field is found in Ol and Kohle, 1943, under the title "Concerning the Dependency of the Octane Number on the Peroxide Content in Cracked Benzine." 4972

(c) Vapor bubble formation in benzine. The director of the experiments, Dr. Schaub, and I developed an apparatus to investigate the vapor bubble formation of auto gasoline. A publication concerning this work appears in the "Automobiltechnischen Zeitschrift" for 1941. A further publication was in the making, but could not be completed.

(d) Manufacture of paraffin by means of distillation and selective decomposition. At the "Ruhr Chemie" the paraffin was decomposed by fractional distillation into soft paraffin, table paraffin and hard paraffin. The crude paraffin yield from the synthesis, called furnace paraffin, was first processed by continuous distillation at 320°C in order to remove the diesel oil content.

The paraffin residue was charged to a vacuum distillation unit and cut at 450°C. The residue was hard paraffin with N P 90. The hard paraffin was chilled for extraction in the wax presses and the accumulated slack wax transferred to the sweating pans. Soft paraffin with a melting point of 30-35°C was drained from the pans leaving a table paraffin with a melting point of 50-52°C. In my experimental laboratory the question was asked, how was it possible to prepare hard paraffin and table paraffin from furnace paraffin without distillation by means of selective solvent analysis. As solvents, there came into question essentially acetone and benzines of different boiling fractions. 4973

ACTIVATION OF METHANE BY HIGH PRESSUREA. E. LUGEN
MAY, 30, 1941

Frames 4974-5021

Abstract

(Very Illegible)

The reactivity of methane under very high pressure can be tested very simply, by letting methane act on an unsaturated hydrocarbon, hexene for example. Analogously, as hexene is converted to hexane by hydrogenation, so must the former be converted to heptane by methanation. With this in mind, a dozen or so experiments were run at Slatineau during 1935-1941. An extensively developed theory as well as written descriptions of these experiments are included in this report, but legibility is too poor to give any continuity. Tables at the end give the resulting production of gas and oil with different injection amounts, at different pressures and with different catalysts.

CORROSION PREVENTION IN DISTILLATION EQUIPMENTHAMBURG: JUNE 13, 1944

Frames 5022-5023

Translation1. Naphthenic Acid Corrosion.

5022

As mentioned by the BPM, special working materials have proved excellent in practice; 1E/8 chrome-nickel steel plated in the form of lining, as well as a special enameling which either absorbs the pressure by means of temperature-change treatment or is adjusted to the expansion coefficient in iron. Especially in the case of naphthenic acid, practice shows that the corrosions are most violent where turbulence occurs in the optimum-temperature range mentioned by BPM. Frequently effected are furnace returnbends, pipe bends in transfer lines, the portion of the evaporation section which is struck by the liquid jet, as well as metals contacted by the liquid surface in the fractionating flask. It is perhaps remarkable that there are naphthene-basic crude oils in the case of which the low-molecular-weight naphthenic acid possesses very much higher corrosion activity. This leads particularly in the reflux circulation to strong corrosion on the one hand and to separation on the other hand of iron naphthenate, which is at first dissolved in the reflux-benzine and then deposited in the evaporation of the reflux as a crust on the fractionating ball cap. It is possible, in the case of vacuum distillation, to reduce the damage of the naphthenic acid by distillation over chalk.

2. Hydrochloric Acid Corrosion

Very frequently this corrosion is confused with the benzine-naphthenic acid corrosion mentioned above, since both behave similarly in their action. The prevention of the hydrochloric acid corrosion by means of ammonia is probably the best, since with sodium hydroxide a similar intensive intermixing, especially of the vapors through the condenser, is difficult. In the case of the ammonia-injection, copper-alloy cooler tubes, armatures, etc., naturally can no longer be used. However, this signifies no special disadvantage. The BPM has made the proposal to remove the magnesium chloride before the distillation, and that the crude oil be mixed with sodium carbonate, whereby in addition to sodium chloride, there forms insoluble magnesium carbonate, which reacts indifferently.

5023

3. Hydrogen Sulfide Corrosion

This corrosion is doubtlessly the most difficult to meet. A chemical inactivation is not possible with a single process. One must therefore go back to corrosion resistant working materials and is hereby limited essentially to aluminum alloys, which, apart from inferior mechanical durability, are also not stable toward the aggressive benzene-naphthenic acids. Very high percentages of hydrogen sulfide occur, in the manufacture of Iraq crude oil, and probably only in the cracking plant. In the simultaneous presence of aluminum-attacking substances, one can almost only fall back on high chromium-alloy steel as a stable working material.

4. Sulfur Dioxide Corrosion

Prevention by means of injection of ammonia into the vapor, if necessary in combination with sodium hydroxide injection into the furnace stream (especially in the case of the redistillation of cracked benzene) is the best way, and leads to more complete removal of all corrosion difficulties. Continuous control of the hydrogen ion concentration in condensed water with the help of electrode cells has proved very good; however, the automatic distribution of the ammonia addition by means of the electrode cells is very uncertain due to the temporary delay in regard to the very slight amount of condensed water and the necessary installation of a condensed water accumulator or separator.

PROPOSAL FOR REFINING HUNGARIAN CRUDE

P. LEFREVRE

OCTOBER 12, 1942

Frames 5024-41

Abstract

The products obtained from the two initial crude oil specimens from Budafapusztai and Lovaszi, have high densities and therefore are not marketable. The benzene, which has too low an octane number, can receive the necessary characteristics only by the addition of tetraethyl lead, alcohol or some other supplementary agent. The high density petroleum must be refined, if one wants to obtain from it a product corresponding to the calorific regulations. The gas oil does correspond to the regulations. The distillates and residues (initial products for the preparation of lubricating oils) must have the wax removed and be treated. The heavy gas oils, slop cuts and crude residues have too high a solidifying point to produce commercial long residuum. On the basis of individual results, we have investigated which arrangements must be provided for in order to obtain marketable products. One of the most necessary items is a cracking plant. Which would make it possible to obtain benzenes with an octane number near 65 and to convert the heavy gas oils, slop cuts and refining residues into commercial benzene and residuum. For the work of the cracking plant four possibilities are furnished: (1) light gas oil entirely for marketing-octane number of the total benzene = 62.5; (2) gas oil in limited amounts for marketing-octane number of the total benzene = 63.3; (3) reforming of a fraction of heavy benzene, light gas oil in limited amounts for marketing-octane number of the total benzene = 65; (4) reforming of a fraction of heavy benzene, light gas oil entirely for marketing-octane number = 65. The choice between the different possibilities is arranged according to the conditions of the Hungarian market and the supply possibility in products such as tetraethyl lead, alcohol and other supplementary materials. However, the benzenes coming from the cracking must

be treated with acid and redistilled, if one wishes to obtain clear benzine (test benzine). In the use of colored benzines, the addition of an agent to prevent the formation of gum is necessary. In each case the cracked benzine must have tetraethyl lead added. The petroleum whose density is too great certainly is not corresponding to the calorific regulations. The crude oil residues are very paraffinic and contain a definite percentage of asphalts and resins; they must be dewaxed and treated in order to obtain commercial lubricating oils. We were guided, by the consideration of an acid refining, a dewaxing and perhaps a deasphaltation. The refinery includes a basic distillation unit; a cracking plant; and equipment for the chemical treatment of benzine, with acids if necessary; a redistillation unit; a unit for treatment of petroleum; a dewaxing unit; a unit for the refining of oils; a section for the preparation of wax; and central power station.

HUNGARIAN OIL PRODUCTION AND REFINERY ACTIVITIES

HAMBURG: MAY 18, 1945

Frames 5042-7

Abstract

This report consists of a number of tables showing the production and exportation of Hungarian petroleum products. The first table shows the yearly demand in mineral oil for 1936-1943, and the monthly demand for 1942-1944. The second table shows the quarterly production for 1942-1944 in benzine, petroleum, gas oil, axle oil, fuel oil and crude oil. The next two tables break up the production of the second table into yearly exports to Germany, Italy and Solvakia for 1941-1943, and the monthly exports for 1943-1944 to Germany, Italy, Slovakia, Switzerland and Bulgaria. The fifth table gives monthly crude oil exports to Croatia and Italy for 1942-1943, while the last table is a summary of the preceding tables.

Abstractor - Robert Doan

RAMAN SPECTRA OF OLEFINS IN CRACKED DISTILLATION FRACTIONS

Frames 5048-5061

Abstract

It is remarked that the samples often changed with time. It is suggested that in the future polymerization inhibitors be added. Since many samples were colored, they were distilled to obtain colorless samples.

Intensities of Raman bands were estimated by eye. The strong lines 1440 to 1460 cm^{-1} and 2730 and 2850-3000 are characteristic of hydrocarbons generally. The next strongest are those characteristic of unbranched olefin-1's: 436, 631, 912, 1296, 1416, 1642. The lines for hexene-1, heptene-1 and octene-1 are fairly well coincident: 360 (strong), 400 (weak?), 430 (medium), 630 (medium), 760 (weak?), 820, 850, 870, 890, 910, (all medium-strong), 990 (weak?), 1110 (medium), 1220 (medium), 1295 (very strong), 1415 (strong), 1642 (very strong). These olefins were the main constituents of the samples analyzed.

Beside these alpha-olefins, which are unbranched at the double bond, there must be other olefins, since there was always a satellite near the 1642 line. This band varied between 1654 and 1666. The spectra of pure olefins had been extensively investigated, and it was found that for an olefin-1, but with branched double bond ($\text{H}_2\text{C} = \text{CR}_1\text{R}_2$), the double bond frequency is at 1650; for an unbranched double bond lying in the chain ($\text{HR}_1\text{C} = \text{CR}_2\text{H}$), it is at 1658 in the case of the cis-form, and at 1674 in the case of the trans-form; and for 3 and 4-fold substituted ethylenes it is at 1668. The camera did not separate these positions. From the positions of the satellites it was concluded that the secondary components are mainly olefin-1's branched at the double bond and the cis-form of olefins with the double bonds in the chains.

To improve the analysis, the fractions were all re-run using a camera of higher dispersion. The films were photometered. The photometer curves were analyzed in two ways. The first, certainly incorrect, was to neglect the background line entirely. In the second method the main 1642 cm^{-1} line was subtracted (designated with corrected background). The values of concentrations calculated are not quite free of arbitrariness since the construction of the background line is somewhat arbitrary. But since all samples were treated similarly, the results are at least comparable, i.e., the rising and falling of concentrations of individual components in different samples means something. From these data the ratios of end double bond to middle double bond compounds were calculated.

Further, it was attempted to evaluate the branching ratios: first for the alpha-olefins and then for the beta-olefins. Samples 1159, 1160, 1161, and 1162 seem to have equal ratios for alpha- and beta-olefins; while for samples 1164 and 1165 they are different.

Letter by Goubeau

*Enlargements of frames 5058, 5059, 5060 and 5061, related to this work, are included here.

Abstractor - H. Claassen

TABELLE DER INTENSITÄTEN.

5058

a) mit gleichem Untergrund.

	1159	1160	1161	1162	1163	1164	1165
1642	5,06	2,08	1,06	3,95	3,50 1	4,09	3,88
1650	2,35	1,06	0,54	1,	1,78	1,71	0,51
1658	2,28	0,77	0,32	1,35	0,90	1,49	1,08
1668	0,86	0,64	0,10	0,45	0,55	0,36	0,60
1674	0,55	0,07	0,12	0,45	0,27	0,21	0,68

b) mit korrigiertem Untergrund.

	1159	1160	1161	1162	1163	1164	1165
1642	5,06	2,14	1,14		3,51	4,09	3,47
1650	0,48	0,38	0,10		0,92	1,01	0,33
1658	1,10	0,56	0,10		0,61	1,10	0,80
1668	0,60	0,37	0,07		0,50	0,32	0,41
1674	0,43	0,08	0,17		0,27	0,24	0,18

BEZOGEN AUF 1642 CM⁻¹ = 1,00

a) mit gleichem Untergrund.

	1159	1160	1161	1162	1163	1164	1165
1642	1,00	1,00	1,00	1,00	1,00	1,00	1,00
1650	0,46	0,51	0,51	0,34	0,51	0,42	0,13
1658	0,45	0,37	0,30	0,34	0,26	0,36	0,28
1668	0,17	0,31	0,19	0,11	0,16	0,09	0,16
1674	0,11	0,03	0,11	0,11	0,08	0,05	0,18

b) mit korrigiertem Untergrund.

	1159	1160	1161	1162	1163	1164	1165
1642	1,00	1,00	1,00		1,00	1,00	1,00
1650	0,09	0,18	0,09		0,26	0,25	0,10
1658	0,22	0,26	0,09		0,17	0,27	0,23
1668	0,12	0,17	0,06		0,14	0,08	0,12
1674	0,09	0,04	0,15		0,08	0,06	0,05

*
TABELLE DER KONZENTRATIONEN IN VOL. %
BERECHNET AUS DEN INTENSITÄTEN.

5059

a) mit gleichem Untergrund.

Olefine	1159	1160	1161	1162	1163	1164	1165
α -unverzweigt	46	45	50	53	50	52	57
α -verzweigt	21	23	25	18	25	22	7
β -unverzweigt cis	20	17	15	18	13	19	16
β -verzweigt	8	14	4	6	8	5	9
β -unverzweigt trans	5	1	5	6	4	3	10

b) mit korrigiertem Untergrund.

Olefine	1159	1160	1161	1162	1163	1164	1165
α -unverzweigt	66	60	72		61	61	67
α -verzweigt	6	11	6		16	15	6
β -unverzweigt cis	14	16	6		10	16	15
β -verzweigt	8	10	4		8	5	8
β -unverzweigt trans	6	2	11		5	4	3

VERHÄLTNIS VON ENDSTÄNDIGER ZU MITTELSTÄNDIGER DOPPEL-
 BINDUNG.

	1159	1160	1161	1162	1163	1164	1165
a) unkorrigiert							
end/mittel	67/33	68/32	75/25	71/29	75/25	77/26	64/36
	2	3	6	4	5	7	1
	1159	1160	1161	1162	1163	1164	1165
b) korrigiert	72/28	71/29	78/22		77/23	76/24	73/27

*Reproduced as on microfilm.

*
SPEKTRUM DER PROBLEM.

5060

	V1160	V1161	V1162	V1163	V1164	V1165	V1170
	101(2)						
165(8)	168(1)				168(4)		
263(1)	272(0)				364(1)		
286(1)							
307(1)	317(0)				300(3)		
360(4)	364(0)		361(4)	**1(1)	359(4)		364(0)
393(2)			379(2)	391(4)	391(4)		
437(3)					427(4)		434(0)
				444(0)	449(1)		
470(3)0	484(1)				486(2)		
				504(1)			509(0)
					532(1)		
	552(0)		545(2)		557(2)		
	591(1)		607(2)		605(1)		600(0)
616(4)				629(4b)	628(6)		
641(4)	632(1)		641(2)				
	675(0)			633(1)	627(2)		
705(2)			712(3)		716(2)		
	721(1)			721(1)			
**3(3)	754(0)		756(2)	752(1)	762(3)		
785(2)				734(2)			
820(7)	820(2)		821(3)	816(4)	821(10)		
836(3)	846(1)		843(1)				
893(8)	892(3)			892(7b)	894(2)	892(2)	893(1)
910(8)	919(1)		911(6)		909(12)	913(1)	
						934(0)	
	966(1)			962(3)			
994(7)	999(2)		990(4)	991(12)	994(5)		
1005(2)				1005(4)		1004(1)	
1029(2)			1028(3)	1016(3)			
				1030(4)		1036(1)	
1065(6)	1060(2)		1077(3)	1067(5)	1056(6)	1061(1)	1062(1)
					1074(8)		
1106(7)	1105(2)		1110(4)	1108(6)	1105(7)		1101(2)
	1164(1)						1151(0)
1172(2)			1175(1)		1178(3)		1188(1)
1216(4)	1213(1)		1220(3b)	1229(4)	1228(2)		1228(1)
1**9(3)	1247(1)	1243(3)					
				1283(12)	1286(14)	1276(2)	
1290(15)	1289(11)	1289(4)	1297(20)			1295(10b)	1296(7)
1303(15)	1299(11)			1300(12)	1300(14)		
1331(5)	1375(1)	1383(1)	1389(5)	1377(4)	1377(2)		1368(2)7
1416(10)	1412(6)	1418(4)	1417(8)	1416(8)	1414(7)	1415(6)	
1439(15)	1437(15)	1438(5)	1436(20)	1437(15)	1437(15)	1438(10)	1439(9)
1457(15)	1463(15)	1458(4)	1462(20)	1457(15)	1457(15)	1466(10)	

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**Numbers not distinguishable on original.

*SPEKTREN DER PROBLEME

5060

V1160	V1161	V1162	V1163	V1164	V1165	V1170
				1525(2)	1507(1)	1525(1)
		1541(2)			1548(1)	
		1576(0)		1572(1)		
	1605(1)	1610(2)				1611(3)
1643(20)	1642(14)	1644(8)	1642(20)	1641(20)	1643(16)	1641(20)
1654(7)	1653(4)	1662(3)	1666(1)	1655(5)	1657(6)	1661(4)
		1702(0)				
					1734(1)	
					2505(2)	
	2725(1)			2721(2)		2711(3)
2732(3)				2738(2)	2738(2)	
2855(20)	2853(20)	2852(2)	2844(20)	2853(8)	2855(10)	2855(10)
2873(20)	2885(15)		2873(20)	2874(8)	2874(12)	2877(8)
2898(20)	2895(15)		2896(20)		2906(18)	

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*
SPEKTREN DER PROBEN (2. BLATT)

5061

V1159	V1160	V1161	V1162	V1163	V1164	V1165	V1170
2913(20)	2916(15)		2916(20)	2912(9)	2916(18)		2912(20)
2937(20)	2937(20)	2939(4)	2935(8)	2936(9)	2937(20)	2938(9)	
2963(10)	2964(10)	2962(2)	2959(5)	2960(4)	2964(6)	2964(4)	2980(2)
3000(20)	3000(10)	2994(3)	3001(15)	3000(5)9	3000(11)	3003(5)	
			3053(15)				
				3078(10)			3068(4)
3082(15)	3081(8)	3081(4)	3085(15)		3080(10)	3080(10)	

*
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