Patented Apr. 26, 1949 2,468,500

UNITED STATES PATENT OFFICE

2,468,500

LUBRICANT CONTAINING POUR POINT DEPRESSANT

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No Drawing. Application December 28, 1944, Serial No. 570,206

10 Claims. (Cl. 252—59)

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This invention relates to novel condensation products and to methods of preparing and using same and more particularly it relates to the treatment of high molecular weight chemical condensation products having wax modifying properties and having the ability to depress the pour point of waxy mineral lubricating oils when added thereto in small amounts, so as to improve the pour stability characteristics thereof.

Wax modifying agents or pour depressors may be prepared by a number of different methods already known to the art, such as by condensation of relatively long chain paraffinic materials, e. g. chlorinated paraffin wax having a chlorine content of about 10 to 18% chlorine and derived from a paraffin wax having a melting point of 120° to 160° F. or so, or olefins derived therefrom by dehydrochlorination, with aromatic hydrocarbons such as naphthalene, benzene, anthracene and the like, or with other aromatic compounds such as phenol and its homologues. Such condensation is generally effected by means of a Friedel-Crafts catalyst, preferably aluminum chloride, or others such as zinc chlorine, iron chloride, or other halides of these metals, or boron fluoride. The condensation is generally carried out at temperatures ranging from room temperature up to 300° F., preferably not higher than about 170° or 180° F. During the reaction, inert solvents may be used such as refined kerosene or heavy petroleum naphtha, or inert highly chlorinated solvents such as tetrachlorethane, dichlorbenzene, etc. The order of adding the reagents and catalyst may vary. For instance, the chlorinated wax and naphthalene may be mixed together first and then the catalyst added last, or the catalyst may be mixed with the aromatic compound and then the chlorinated wax added last. After the condensation has been completed the residual catalyst is usually hydrolyzed by addition of water, alcohol, caustic soda, or mixtures thereof, and finally the reaction products are subjected to distillation under reduced pressure such as up to 500° or 600° F. under a vacuum at least as low as 20 mm. mercury absolute pressure or with fire and steam distillation.

The condensation product obtained as distillation residue from the above described process is generally a complex mixture of chemical compounds having an average molecular weight between the approximate limits of 1000 and 2000 or so and ordinarily has good pour depressing potency; for instance, when a small amount thereof such as 1 or 2% or even a much smaller amount such as 0.1% is added to a waxy mineral lubricating oil for instance having a relatively high pour point of +30° F., the pour point of the resultant blend will be much lower such as below 0° F. and may be as low as —35° F. or considerably lower. Even small amounts of pour depressor such as 0.1, or .05% may effect a substantial pour depressing action.

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While the wax modifiers made in the above manner have excellent pour depressing properties as measured by the A. S. T. M. (American Society of Testing Materials) procedure, they do not have as good pour stability properties as desired. More specifically, under certain conditions of winter storage the pour point of a blend of waxy lubricating oil containing such pour depressor may on certain occasions rise to relatively high values such as to render ineffective the original purpose of the pour depressor. An article by C. E. Hodges and A. B. Boehm published in the Oil and Gas Journal, volume 42, page 103, June 26, 1942, on "pour point stability of pour depressant treated oils under winter storage" discusses more in detail the problem of pour stability and a suitable test for determining the stable pour point temperature of oils. Briefly, the test, often referred to as "test V procedure" comprises heating the oil containing the pour depressor to 120° F. to insure complete solution of the pour depressor, then subjected to six cycles consisting of cooling the blend to —28° F. and warming up to temperatures ranging from 40° F. in the second cycle, by 10° F. stages, down to 0° F. in the sixth cycle, the samples being tilted every 5° F. during the cooling stages and their temperatures and fluidity recorded. A complete report of the test includes a statement of the solid (the highest temperature at which the point sample was solid) in each cycle, but the essential feature of the test is a report of the stable pour point which is considered to be 5° F. higher than the highest solid point noted in any of the cycles. When subjected to this test, the waxy oils containing the wax modifiers discussed above, generally show stable pour points ranging from —15° F. to as high as +15° F. or so depending upon the type and amount of pour depressor used, in spite of the fact that these same blends show regular A. S. T. M. pour points generally much lower.

It has now been discovered, and is the chief feature of the present invention, that the pour stability characteristics of such wax modifiers can be very greatly improved by subjecting the wax modifiers to a secondary chemical condensation with a low molecular weight polyhalomethane compound. Such reagent should have the general formula $R_{4-n}CX_n$ where R represents like or unlike radicals consisting of hydrogen or low molecular weight hydrocarbon groups, X is halogen and n is at least 2. At least 1 R is preferably an aromatic hydrocarbon group, and n is preferably 2. Thus preferred examples of this condensation reagent are benzal chloride $C_6H_5CHCl_2$, dichlormethyl naphthalene, or naphthyl dichlormethane $C_{10}H_7CHCl_2$, dichlormethyl xylene

$(CH_3)_2C_6H_3CHCl_2$

diphenyl dichlormethane $(C_6H_5)_2CCl_2$, and the like, although other compounds coming within the general class mentioned above may be used such as benzal bromide or iodide, benzotrichloride $C_6H_5CCl_3$, dichlormethyl anthracene $C_{14}H_9CHCl_2$, dichlormethyl diphenyl $C_{12}H_9CHCl_2$, methylene dichloride or dichlormethane H_2CCl_2, ethylene dichloride or methyl dichlormethane CH_3CHCl_2, etc.

The secondary reaction, i. e. the condensation of the original wax modifier with the polyhalomethane compound may be brought about under substantially the same conditions as used in the primary reaction and with the same type of catalyst, etc., but it is found that this reaction proceeds with greater ease than the first condensation, chlorinated solvents, e. g. tetrachlorethane give better results than hydrocarbon solvents, and in general, lower temperatures may be used.

Two alternative procedures may be used in carrying out the present invention. One is, as described above, to first make and completely isolate the primary condensation product or wax modifier and then subject it to the secondary condensation with polyhalomethane compound directly to the first condensation reaction mixture without hydrolysis and removal of residual catalyst and distillation of the reaction mixture to obtain the first condensation product in a pure and isolated condition. As compared to the separate two-step process, the direct one-step process has several distinct advantages, namely that it only requires one catalyst hydrolysis step instead of two, and it eliminates extra washing and distillation of the condensation product from the first condensation.

The final condensation product of this invention has a substantially higher molecular weight than the wax modifying starting material, and although the mechanism of the chemical reaction involved is not known with certainty, or the reason why this reaction should make a product of such superior pour stability characteristics, it is believed that one molecule of the polyhalomethane compound condenses with two molecules of the aliphatic aromatic wax modifier causing what may be termed an interlinking thereof through their aromatic nuclei. It appears to be essential or at least very advantageous to have the aromatic portions of the wax modifier starting material brought very close together by being attached to a single aliphatic carbon atom in the polyhalomethane compound. Examination of the product by ultraviolet light indicates a higher molecular weight in the aromatic portion of the molecule as compared to the wax modifier starting material. The molecular weight of this final product is believed between the approximate limits of 2000 and 5000, and preferably about 3000 to 4000. It is ordinarily an extremely viscous liquid having for instance a viscosity of about 2500 to 10,000 seconds, preferably about 4000 to 5000 seconds, Saybolt at 210° F.

The objects and advantages of the invention will be better understood from the following examples.

Example 1

A pour point depressant is produced by condensing 100 parts by weight of chlorparaffin (14% chlorine) with 15 parts by weight of naphthalene using 2½ parts by weight of aluminum chloride as the catalyst, adding the chlorwax last to the reaction mixture. The reaction was conducted at a temperature of about 88° F. in the presence of about 30–40 parts (based on chlorparaffin) of kerosene as solvent. After a reaction time of 4½ hours the catalyst is hydrolyzed by the addition of an excess of isopropyl alcohol and aqueous caustic soda and the aluminum hydroxide produced by hydrolysis was removed. The product was then distilled to remove the diluent and the unreacted constituents to a temperature of 600° F. with fire and steam. The material recovered as the distillation residue is a wax modifying agent and is referred to here and after as the initial condensation product of Example 1.

200 grams of this initial condensation product was recovered in 300 cc. of tetrachlor-ethane as solvent. To this is added 15 grams of aluminum chloride and the temperature adjusted to 90° F. 30 grams of benzal chloride are then added to the reaction mixture with agitation over a period of 30 minutes. After the addition of the benzal chloride the reaction temperature was maintained at 90° F. for a period of 2½ hours after which it was diluted with a liter of solvent and the aluminum chloride destroyed by neutralizing with a mixture of alcohol and water. After settling and discarding the aqueous layer the product obtained was distilled with fire and steam at 600° F. The yield of a very viscous dark brown material weighing 198 grams was obtained as product.

The product obtained as described above was tested for ordinary pour depressant potency by the standard A. S. T. M. procedure in two different types of waxy lubricating oils, the following results being obtained:

Percent Product added to	Test Oil #1	Test Oil #2
	° F.	° F.
None	+30	+30
0.0375	+5	−5
0.075	−5	−15
0.15	−20	−20

The pour stability properties of the product were tested by the "Test V" procedure, in a United 180 neutral alone, referred to as Oil A which is a paraffinic light lube oil, and the same oil containing 2% of Panhandle bright stock which blend is referred to as Oil B. Table I shows in detail the solid points obtained in the individual cycles and Table II summarizes the results.

Table I

	Solid Points in Cycle				
	2	3	4	5	6
Oil A + 1% p. d. A	−12	−19	−8	−8	−11
Oil A + 1% Benzal cond. prod. of Ex. 1	[1]−16	[1]−22	[1]−19	−15	−16
Oil B [2] + 1% p. d. A	−10	−19	−8	−12	−10
Oil B + 1% Benzal cond. prod. of Ex. 1	[1]−16	[1]−22	[1]−18	[1]−20	[1]−23

[1] Indicates that the sample did not go solid.
[2] Oil B is oil A + 2% bright stock.

Table II

	Solid in Cycle Number	Times Solid	Highest Solid Pt. in Test V (°F.)	Stable Pour Point (°F.)
Oil A + 1% p. d. A	all	5	−8	−3
Oil A + 1% Benzal cond. prod. of Ex. 1	5,6	2	−15	−10
Oil B [2] + 1% p. d. A	all	5	−8	−3
Oil B + 1% Benzal cond. prod. of Ex. 1	None	None	[1] None	<−28

[1] Still fluid in all cycles.
[2] Oil B is oil A + 2% bright stock.

As indicated in Table II, whereas the stable

pour point of the commercial pour depressor A was minus 3, that of the condensation product of Example 1 was minus 10° F., which is a very substantial improvement. In fact, the original wax modifier used as starting material in Example 1 is a material of the same general type as the commercial pour depressor A, and therefore, it is clear that the secondary reaction of this invention namely, the condensation product of the wax modifier with benzal chloride, was responsible for the reduction of the stable pour point of the commercial pour depressor A from minus 3 down to minus 10° F. This is important not only due to the actually lower stable pour point, but also because during various cycles of alternating mild and cold temperature conditions during the winter months, the oil containing pour depressor A may become solid many times more than the same oil containing the benzal-treated pour depressor; in the "Test V" pour stability test, as indicated in Tables I and II both oils A and B containing pour depressor A became solid five times, whereas similar blends containing the benzal-treated product only became solid two times for the oil A blend, and none for the oil B blend.

EXAMPLE 2

Another series of tests was made in order to compare the pour stability characteristics of the same two additives used in Example 1 (except that a different sample of pour depressor A was used) in a different lubricating oil base stock namely, a blend (identified as oil C) of paraffinic lubricating oil of medium viscosity, referred to as Baton Rouge 442 neutral, containing 5% of Panhandle bright stock. Table III shows in detail the solid points obtained in the individual cycles of the pour stability test, and Table IV summarizes the results, the A. S. T. M. pour point also being shown for comparison.

Table III

	Solid Points in Cycle				
	2	3	4	5	6
Oil C+0.5% p. d. A [2]	−2	+14	+10	+2	−6
Oil C+1.0% p. d. A [2]	+2	<−20	−3	−4	−16
Oil C+0.5% Benzal Cond. prod. of Ex. 1	[1] <−20	−5	3	+6	−4
Oil C+1.0% Benzal Cond. prod. of Ex. 1	[1] <−21	[1] <−20	[1] <−20	[1] <−20	−21

[1] Indicates that the sample did not go solid.
[2] Different sample than used in Example 1.

Table IV

Additive	Solid in Cycle No.	Times Solid	Highest Solid Pt. in Test V	Stable Pour Point °F.	A. S. T. M. Pour Point °F.
Oil C+0.5% p. d. A [2]	All	5	+14	19	−10
Oil C+1.0% p. d. A [2]	2, 4, 5, 6	4	+2	7	<−35
Oil C+0.5% Benzal cond. prod. of Ex. 1	3, 4, 5, 6	4	+6	11	−15
Oil C+1.0% Benzal cond. prod. of Ex. 1	6	1	−21	−16	−25

[2] Different sample than used in Example 1.

Here again in Table IV, as in Table II of Example 1, the benzal condensation product showed substantially superior pour stability characteristics as compared to the commercial pour depressor A. This is not only seen in column 4 showing that the stable pour point with the benzal condensation product was minus 16° F. in 1% concentration, whereas pour depressor A had stable pour points of only 7° F. The extra reduction in stable pour point from plus 7 to minus 16 is very difficult to obtain and is a very substantial improvement. From a practical point of view, columns 1 and 2 show even more strikingly the superiority of the benzal condensation product of this invention, by showing that in 1% concentration the blend containing this addition agent only became solid once in all of the cycles, whereas pour depressor A became solid 4 times.

It is interesting to note in column 5 for comparison that the A. S. T. M. pour points of the two blends containing 1% of addition agent were at least as low as minus 25° F., whereas the best stable pour point was minus 16; in fact, the A. S. T. M. pour points for the blends containing 1% of pour depressor A, and the benzal condensation product, were inversely proportional to the stable pour points. It is obvious, therefore, that the stable pour point and the number of times which a sample becomes solid in the 5 cycles of the stable pour point test, are better criteria of the practical merits of a pour depressor.

EXAMPLE 3

The following proportion of reagents were used: 2 gals. dichlor benzene as solvent, 15 lbs., 3 oz. naphthalene, 16 gals. chlorinated wax (14.6% Cl), 3 lbs., 2 oz. $AlCl_3$, in carrying out the reaction the reactor was charged with the solvent, naphthalene and aluminum chloride. The chlorinated wax was then added to the reaction mixture while agitating over a period of 35 minutes. The reaction temperature was raised from 100° F. to 112° F. After the addition of the chlorinated wax the reaction temperature was adjusted to 125° F. and maintained thereat for a period of 4 hours. At this point of the reaction 13 lbs., 6 oz. of benzal chloride were added over a period of 35 minutes. The reaction was extremely vigorous and a considerable amount of foaming took place such that an additional 2 gals. of solvent was added during the course of adding the benzal chloride. After the addition of the benzal chloride the reaction mixture was maintained at 125° F. for an additional 30 minutes whereupon the temperature was reduced to about 100° F. and the aluminum chloride destroyed with a mixture of 6 gals. of aqueous sodium hydroxide (25%) and 8 gals. isopropyl alcohol. The product was recovered as described in Example 2.

The pour stability properties were tested by "Test V" procedure and the following results were obtained:

	Percent Additive	Test V Solid Pts. Cycle 2	Test V Solid Pts. Cycle 3
Initial condensation product of Ex. 1	0.4	−2	+12
	1.0	+20	+10
Benzol condensation product of Ex. 2	0.4	−10	−8
	1.0	−8	−3

The above data show that the benefits of the invention can be obtained by carrying out the benzal condensation immediately after effecting the primary condensation and before actually recovering the primary condensation product from the reaction mixture, thereby avoiding duplication of the recovery steps including hydrolysis and removal of residual catalyst and distillation under reduced pressure to remove solvent and any volatile condensation products.

EXAMPLE 4

A wax modifier was made according to the general procedure described in Example 1 (1st paragraph), and then 100 parts by weight of this initial condensation product were dissolved in 200 parts by weight of dichlorbenzene solvent, after which 7.5 parts by weight of aluminum chloride were added, and finally 15 parts by weight of benzal chloride were added with stirring, the reaction temperature being about 90° F. After a reaction period of about ½ hour, the reaction was stopped and the final condensation product was recovered in the same manner as described in the second paragraph under Example 1. The initial condensation product and the benzal condensation product were then examined for pour stability characteristics while subjecting them to the "Test V" procedure through the third cycle, the results of the second and third cycles being shown in the following table:

Table V

	Percent additive	Test V Solid Pt.	
		Cycle 2	Cycle 3
Init. cond. prod. Ex. 4	1.0	−2	+4
Benzal cond. prod. Ex. 4	1.0	−16	−12

The above results show that the final benzal condensation effected a very substantial improvement in the pour stability characteristics, namely by lowering the solid point of the second cycle from −2 to −16, and in the third cycle from +4 to −12, when the condensation products were used in −1.0 concentration.

EXAMPLE 5

Another wax modifier was made according to the general procedure described in Example 1 (1st paragraph), and the resulting initial condensation was further condensed with benzal chloride using the procedure described above under Example 4, except that the final condensation reaction was permitted to go for a longer time, samples being taken after about 1 hour and 1½ hours, the final condensation product being in each case recovered and tested for pour stability characteristics as in Example 4 with the following results:

Table VI

	Per cent additive	Test V Solid Pt.	
		Cycle 2	Cycle 3
Init. cond. prod. Ex. 5	0.4	0	+10
	1.0	+7	+11
Benzal cond. prod. Ex. 5 after 1 hr. reaction	0.4	−8	−2
	1.0	−12	+2
Benzal cond. prod. Ex. 5 after 1½ hr. reaction	0.4	−6	+1
	1.0	−10	−4

The above results indicate that the benzal condensation, when carried out with a reaction time of 1 hour or 1½ hours, gave, in both instances, a very substantial improvement in both stability characteristic as shown by the lower solid point in both the second and third cycles in the "Test V" procedure, and when tested in two different concentrations now namely 0.4% and 1.0%.

EXAMPLE 6

Another test was made to show the application of the invention with only one catalyst removal step and one final distillation step; in other words the general procedure used was the same as that described in Example 3.

12.0 parts by weight of naphthalene and 11.3 parts by weight of dichlorbenzene as solvent were charged into a reactor, then 2.3 parts by weight of aluminum chloride catalyst were added, and finally 100 parts by weight of chlorinated wax (14.5% chlorine content). A reaction temperature of about 125° F. was maintained for 4 hours and then 5.2 parts by weight of benzal chloride were added with continued stirring the benzal condensation reaction was carried out for one hour and then residual catalyst was destroyed and removed and the final condensation product was recovered by fire and steam distillation up to 570° F. Pour stability tests were as follows, showing for comparison the initial condensation products of Example 1.

Table VII

	Per Cent Additive [1]	Test V Solid Pt.	
		Cycle 2	Cycle 3
Init. cond. prod. of Ex. 1	0.4	−2	+12
Benzal cond. prod. of Ex. 6	0.4	−10	−5

[1] Test oil is A +2.5% bright stock.

The above data show that the benzal condensation effects a very substantial improvement in pour stability when applied without intermediate isolation of the initial condensation product.

EXAMPLES 7 AND 8

Two additional tests were made using the same general procedure as outlined in Example 6 except that much larger quantities of materials were used and two different proportions of benzal chloride were used. In Example 8 the amount of benzal chloride used was the same as Example 6, whereas in Example 7 only 70% as much benzal chloride was used. After 4 hours the benzal chloride was added, using 390 pounds in Example 7 and 520 pounds in Example 8, with stirring, and the reaction was permitted to continue for an additional 4 hours, samples being withdrawn at various intervals to charge the progress of the condensation and to determine the optimum reaction period. A benzal condensation reaction period of about 2 hours gave the best results, although fairly good results were obtained within the broader range of about 1 to 3 hours.

When tested in 1% concentration in a wax mineral lubricating oil blend of oil A to which had been added 2.5% of Panhandle bright stock, the following pour stability tests were obtained in cycles 2 and 3, showing for the sake of comparison an initial wax-naphthalene condensation product similar to, but not identical with, those referred to in previous examples.

Table VIII

	Test V Solid Pt. in—	
	Cycle 2	Cycle 3
Benzal cond. prod. Ex. 7	−8	−5
	−10	−11
Benzal cond. prod. Ex. 8	−10	−7
Init. cond. prod	−2	+2

The above data show that the benzal condensation effected a very substantial improvement in pour stability in both Examples 7 and 8.

EXAMPLE 9

150 grams of the initial condensation product of Example 1 was dissolved in 200 ml. of o-dichlorbenzene as solvent. To this was added 15 grams of aluminum chloride and the temperature adjusted to 90° F. 30 grams of diphenyl dichloro methane $(C_6H_5)_2CCl_2$ were then added to the reaction mixture with agitation over a period of 30 minutes. Thereafter the procedure of Example 1 was followed and a yield of 150 grams of a very viscous dark brown material was obtained.

The following table presents the A. S. T. M. Pour Depressant data:

Percent Product added to	Test Oil No. 1	Test Oil No. 2
None	+30	+30
0.0375	+5	−5
0.05	+5	−10
0.125	−15	−20

The pour stability properties of the product were tested by the "Test V" procedure in a paraffin light lube oil containing 3.5% Panhandle bright stock. Table IX shows in detail the solid points in the individual cycles in comparison with Pour Depressant A referred to in Example 1.

Table IX

Per cent	Solid Points in—	
	Cycle 2	Cycle 3
Oil + 1.25 p. d. A	+18	+12
Oil + 1.50 p. d. A	+2	−4
Oil + 1.25 $(C_6H_5)_2CCl_2$ cond. prod	[1]−21	−12
Oil + 1.50 $(C_6H_5)_2CCl_2$ cond. prod	[1]−18	−14

[1] Indicates that the sample did not go solid.

As indicated in Table IX, the stable pour points of commercial pour depressant A were lowered from 10° to 40° F., which is a substantial improvement.

EXAMPLE 10

In this test the same general procedure was followed as in Example 6, except that 12 parts of diphenyl dichloro methane were added instead of the benzal chloride. 67 parts of solvent and 4 parts of catalyst were also added with the modifier. Pour stability tests were as follows, showing for comparison the initial condensation product of Example 1.

Table X

	Per cent Additive[1]	Test V Solid Points	
		Cycle 2	Cycle 3
Initial cond. prod. of Ex. 1	1.25	+18	12
	1.5	+2	−4
Cond. prod. of Ex. 10	1.25	[2]−18	0
	1.5	[2]−22	−21

[1] Note: Test oil is a light paraffinic lube oil + 3.5 percent Panhandle bright stock.
[2] Indicates that the sample did not go solid.

The above data show that the condensation effects a very substantial improvement in pour stability when applied without intermediate isolation of the initial condensation product.

EXAMPLE 11

Commercial pour depressant B, reported to be a wax-phenolic condensation product, was modified by benzal chloride using a similar procedure as used in Example 1. In this case 150 grams of the initial wax-modifying agent were used instead of 200 grams. Other proportions of reactants and procedure were the same.

The pour stability properties of the product were tested by the "Test V" procedure, Table XI showing the solid points obtained in the individual cycles in comparison with the solid points of the commercial pour depressant B.

Table XI

	Per Cent Additive	Test V Solid Points	
		Cycle 2	Cycle 3
Commercial Pour Depressant B	1.25	−12	+10
	1.5	−20	−2
Commercial Pour Depressant B condensed	1.25	[1]−20	−4
Commercial Pour Depressant B with benzal chloride	1.5	[1]−23	−7

[1] Indicates sample did not go solid.
NOTE: Test oil—light paraffinic lube oil+3.5% Panhandle bright stock.

As indicated in Table XI a substantial improvement in pour stability was obtained by condensation of the reported wax-phenol commercial pour depressant with benzal chloride.

It is not intended that this invention be limited to the specific examples which have been given merely for the sake of illustration nor necessarily by any theory as to the mechanism of the operation of the invention, but only by the appended claims in which it is intended to claim all novelty inherent in the invention as well as all modifications coming within the scope and spirit of the invention.

We claim:

1. The process of improving the pour point stability of a wax modifier made by an initial Friedel-Crafts condensation of about 1 to 5 mols of chlorinated paraffin wax containing about 10 to 20% of chlorine with one mol of a low molecular weight aromatic compound in the presence of an inert solvent, to make an initial condensation product having a molecular weight of at least 1,000 and having wax modifying properties, comprising subjecting said initial condensation product to a further Friedel-Crafts condensation with an aryl polyhalomethane compound, hydrolyzing and removing the catalyst and distilling the reaction products under reduced pressure to at least 500° F. to obtain the desired condensation product as distillation residue.

2. Process according to claim 1 in which the low molecular weight aromatic compound used is naphthalene.

3. Process according to claim 1 in which the low molecular weight aromatic compound used is phenol.

4. Process according to claim 1 in which the polyhalomethane compound is benzal chloride.

5. In the process of making a wax modifier by condensation of about 100 parts by weight of chlorinated paraffin wax containing about 14% chlorine with about 15 parts by weight of naphthalene in the presence of aluminum chloride as catalyst and in the presence of a refined kerosene as a solvent, to make an initial condensation product having a molecular weight of at least 1,000 and having pour depressing properties, the improvement comprising subjecting said initial condensation product to a further condensation with about 30 parts by weight of benzal chloride in the presence of aluminum chloride as catalyst and in the presence of an initial solvent, hydrolyzing and removing the catalyst, and subjecting the reaction products to fire and steam distillation up to 600° F. to obtain as distillation residue a final condensation product of improved pour stability characteristics.

6. Process according to claim 5 in which the initial condensation product is recovered from the initial condensation reaction products by hydrolysis and removal of catalyst and distillation under reduced pressure before subjecting it to the final condensation step.

7. Process according to claim 5 in which the primary condensation product is subjected to the final condensation reaction without recovering it from the primary reaction products.

8. A product comprising essentially a product obtained by the Friedel-Crafts condensation of 15 to 30 parts by weight of an aryl substituted polyhalomethane compound and 100 to 200 parts by weight of a Friedel-Crafts condensation product of a chlorinated paraffin wax having a chlorine content of 10 to 18% by weight and a compound selected from the class consisting of naphthalene and phenol at a temperature in the range of from room temperature to about 300° F., said product being hydrolyzed, the catalyst removed and the product distilled under reduced pressure to at least 500° F. obtaining the desired condensation product as a distillation residue.

9. A lubricant having an improved stable pour point comprising essentially a product obtained by the Friedel-Crafts condensation of 15 to 30 parts by weight of an aryl substituted polyhalomethane compound and 100 to 200 parts by weight of a Friedel-Crafts condensation product of a chlorinated paraffin wax having a chlorine content of 10 to 18% by weight and a compound selected from the class consisting of naphthalene and phenol at a temperature in the range of room temperature to about 300° F., said product being hydrolyzed, the catalyst removed and distilled under reduced pressure to at least 500° F. obtaining the desired condensation product as a distillation residue.

10. A lubricating oil composition having a stable low pour point comprising a major portion of waxy mineral lubricating oil and a pour depressing amount of about 0.1 to 2% of a product obtained by the Friedel-Crafts condensation of 15 to 30 parts by weight of benzal chloride and 100 to 200 parts by weight of the Friedel-Crafts condensation product of a chlorinated wax having a chlorine content of 10 to 18% by weight and a compound selected from the class consisting of naphthalene and phenol at a temperature in the range of room temperature to about 300° F., said initial condensation product having a molecular weight ranging from 1,000 to 5,000, said benzal chloride wax aromatic product being hydrolyzed, catalyst removed and product distilled under reduced pressure to at least 500° F. to obtain the desired product as a distillation residue.

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