

DIALKYL FUMARATE-VINYL ACETATE COPOLYMERS USEFUL AS DEWAXING AIDS1. Field Of The Invention

The invention relates to copolymers of dialkyl fumarate and vinyl acetate, wherein a major weight portion of said alkyl groups are C₂₀ to C₂₄ alkyl groups, which copolymers are useful in dewaxing oil, particularly in propane dewaxing processes.

2. Description Of The Prior Art

U.S. Patent 3,729,296 discloses copolymers of long chain dialkyl fumarate and vinyl acetate, as a wax crystal modifier, including use as a dewaxing aid.

U.S. Patent 4,377,467 describes the use of different polymers as dewaxing aids including the use of mixtures of different dewaxing aid polymers.

SUMMARY OF THE INVENTION

The present invention represents a further improvement over U.S. 3,729,296 by the finding that forming the copolymer within certain specific viscosity ranges improves the performance of the polymer as a filtration aid in propane dewaxing.

The Copolymer

The dialkyl fumarate will have 50 to 100 wt. % , preferably 70 to 100 wt. % of its alkyl groups in the C₂₀ to C₂₄ range. The remaining alkyl groups may be either above C₂₄ or below C₂₀, such as groups derived from tallow alcohols, or even methyl or ethyl alcohols, e.g., see U.S. Patent 3,765,849. Behenyl alcohol is especially preferred for forming the fumarate. The copolymer is formed under nitrogen by a free radical reaction by heating in a solvent the monomers together in about equi-molar proportions, with a free radical initiator, such as a peroxide. However, the overall conditions of time, temperature, peroxide, amounts



1 of solvent, peroxide, etc. are chosen to form polymers
2 having a Specific Viscosity of about 2.5 to 8 or higher,
3 e.g. about 2.7 to 6, preferably 2.7 to 4.5, when measured
4 as a 2 wt. % solution of the copolymer in mixed xylenes at
5 40°C.

6 The Oil To Be Dewaxed

7 Any waxy petroleum oil stock or distillate
8 fraction thereof may be dewaxed employing the dewaxing aid
9 of this invention, although heavy feedstocks are preferred.
10 Illustrative but non-limiting examples of such stocks are
11 (a) distillate fractions that have a boiling range within
12 the broad range of from about 250° to 700°C., with
13 preferred stocks including lubricating oil and specialty
14 oil fractions boiling within the range of from between
15 about 300° and 650°C. and (b) bright stocks and deasphalted
16 resids having an initial boiling point above about 425°C.
17 Additionally, any of these feeds may be hydrocracked prior
18 to distilling or deasphalting. These may come from any
19 source such as paraffinic crudes obtained from Aramco,
20 Kuwait, the Panhandle, North Louisiana, etc., naphthenic
21 crudes, such as Tia Juana, Coastal crudes, etc., as well as
22 the relatively heavy feedstocks such as bright stocks
23 having a boiling range of 565+°C. and synthetic feedstocks
24 derived from Athabasca tar sands, Cold Lake crude, coal,
25 etc.

26 The Dewaxing Process

27 A solution of dewaxing aid dissolved in an
28 appropriate solvent such as a light heating oil or a light
29 mineral oil fraction is mixed into the wax-containing oil
30 and the mixture heated to a temperature higher than the
31 cloud point of the oil (about 50° to 120°C.). This mixture



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1 is introduced, along with the dewaxing solvent, into a
2 chilling zone and chilled to a temperature necessary to
3 yield the desired pour point for the resulting dewaxed oil.
4 The chilling produces a slurry comprising dewaxed oil and
5 solvent along with solid particles of wax which contain the
6 dewaxing aid. This slurry is then sent to a wax filter to
7 separate the dewaxed oil and solvent from the wax parti-
8 cles.

9 The ratio of solvent to waxy oil would generally
10 range from about 0.5 to 10 and preferably from 0.5 to 3.0
11 volumes of solvent per volume of oil. The optimum amount
12 of dewaxing solvent employed is of course determined by the
13 wax content of the oil, viscosity, pretreatment and
14 dewaxing conditions.

15 The dewaxing aid is added to the waxy oil feed
16 in an amount ranging from about 0.01 to 0.50 wt. % and
17 preferably from about 0.02 to 0.2 wt. % of the oil.

18 Other dewaxing aids, each in similar amounts
19 i.e. 0.01 to 0.50 wt. %, preferably 0.02 to 0.2 wt. %,
20 based on the weight of oil may also be added. Acryloid 150
21 which is a methacrylic acid ester polymer is frequently
22 used as such a co-dewaxing aid, e.g. see U.S. 4,377,467,
23 and has been found particularly useful with the fumarate-
24 vinyl acetate copolymers of the invention.

25 The invention will be further understood by
26 reference to the following examples.

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1 EXAMPLES

2 A copolymer of behenyl fumarate and vinyl
3 acetate having a Specific Viscosity of 3.0 when measured at
4 a concentration of 2 wt. % polymer in 98 wt. % xylene at
5 40°C was prepared as follows:

6 Behenyl fumarate (456 g), vinyl acetate (148 g),
7 and cyclohexane (372 g) are charged to a resin kettle and
8 sparged with nitrogen. The mixture is heated under a
9 nitrogen blanket to 75°C with stirring until it is
10 completely dissolved. Benzoyl peroxide (0.43 g) in ethyl
11 acetate (~10 g) is sparged with nitrogen and added to the
12 mixture. After six hours the behenyl fumarate is com-
13 pletely consumed and the reaction is quenched with 2,6-
14 di-tert-butyl cresol (0.40 g). The yield of polymer based
15 on behenyl fumarate is 98%.

16 The above polymer, along with polymers of
17 Specific Viscosity of 0.3, 2.2, and 4.9 were tested in the
18 propane dewaxing of a 600 Neutral Oil (600 SUS viscosity at
19 100°C) under conditions simulating commercial plant
20 operation. The oil was diluted with 1.4 to 1.6 volumes of
21 propane per volume of oil. The fumarate-vinyl acetate
22 copolymer was added at a treat rate of 0.03 wt. % active
23 ingredient (a.i.) of copolymer, based on the weight of the
24 oil. Acryloid 150 was also added as a co-dewaxing aid at a
25 treat level of 0.040% a.i., based on the weight of oil.
26 The test results are summarized in the following Table.



TABLE

EFFECT OF BEHENYL FUMARATE-VINYL ACETATE
MOLECULAR WEIGHT ON DEWAXING PERFORMANCE

<u>Specific</u> <u>Viscosity</u>	<u>Feed Filter</u> <u>Rate (m³/m²/d)</u>	<u>Dewaxed Oil</u> <u>Yield (%)</u>
0.3	9	59
2.2	9	64
3.0	39	73
4.9	32	71

As seen by the above data, the higher Specific Viscosities gave a much more rapid filtration rate (and a higher yield of dewaxed oil). Filter rates of 39 cubic meters per square meter of filter surface per day (m³/m²/d) were obtained at 3.0 Specific Viscosity which appeared about optimum with this oil.

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CLAIMS:

1. A copolymer of dialkyl fumarate and vinyl acetate having a Specific Viscosity measured at 2 wt. % solution in xylene at 40°C of at least 2.5, and wherein 50 to 100 wt. % of said alkyl groups are C₂₀ to C₂₄ alkyl groups.
2. A copolymer according to claim 1, wherein said dialkyl fumarate is behenyl fumarate.
3. A copolymer according to claim 2, wherein said Specific Viscosity is 2.7 to 6.
4. A copolymer according to claim 3, wherein said Specific Viscosity is about 3.
5. In a dewaxing process, wherein the copolymer of claim 1 is used as a dewaxing aid.
6. In a propane dewaxing process, wherein the copolymer of claims 2-4 is used as a dewaxing aid.

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