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(54) **NOVEL LOW VISCOSITY FUNCTIONAL FLUID COMPOSITION**

NEUARTIGE FUNKTIONELLE FLUIDZUSAMMENSETZUNG MIT NIEDRIGER VISKOSITÄT

NOUVELLE COMPOSITION FLUIDE FONCTIONNELLE DE FAIBLE VISCOSITÉ

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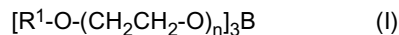
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Description

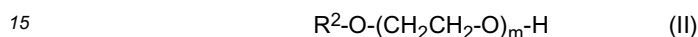
[0001] The present invention relates to a low viscosity functional fluid composition comprising

5 (A) from 30 to 75% by weight, based on the weight of the total composition, of one or more alkoxy glycol borate esters having the general formula (I)



10 wherein R¹ is a C₁- to C₄-alkyl radical or a mixture of such radicals and n has a value of from 2 to 6,

(B) from 20 to 65% by weight, based on the weight of the total composition, of one or more alkoxy glycol components having the general formula (II)



wherein R² is a C₁- to C₈-alkyl radical or a mixture of such radicals and m has a value of from 2 to 6, R² and/or m being different or identical to R¹ and/or n, respectively, comprising at least 60% by weight species with m = 3,

20 (C) from 0.5 to 7% by weight, based on the total weight of the composition, of an additive package comprising one or more additives with corrosion inhibition action, wherein at least one of the additives contained in the additive package of component (C) is selected from alkylamine ethoxylates which comprise at least one linear C₆ to C₁₃ alkyl chain and from 1.5 to 15 EO units

25 exhibiting a low temperature kinematic viscosity of less than 700 centistokes, determined at -40°C and exhibiting a dry equilibrium reflux boiling point (ERBP) of at least 270°C and a wet equilibrium reflux boiling point (WERBP) of at least 180°C.

[0002] The said low viscosity functional fluid composition is useful in a variety of applications and in particular as a brake fluid, especially for new electronic or automated anti-lock brake systems which require lower viscosity fluids for satisfactory operation at low temperatures.

30 Functional fluid compositions based on borate esters are well known in the art. To be useful for example as DOT 4 or DOT 5.1 brake fluids, these borate ester based compositions must meet stringent physical properties and performance requirements particularly with respect to minimum dry equilibrium reflux boiling point ("ERBP"), minimum wet equilibrium reflux boiling point ("WERBP") and maximum low temperature kinematic viscosity (e.g. determined at -40°C) while maintaining adequate resistance to corrosion, stability and meeting other physical property requirements such as pH, reserve alkalinity and rubber swell.

[0003] WO 00/65001 describes hydraulic fluids comprising alkoxy glycol borate esters, alkoxy glycols and corrosion inhibitors, further containing cyclic carboxylic acid derivatives.

40 **[0004]** WO 02/38711 describes low viscosity functional fluid compositions comprising alkoxy glycol borate esters, alkoxy glycol components and additives such as corrosion inhibitors, wherein the alkoxylation degrees of the alkoxy glycol borate esters and the alkoxy glycols are restricted to a certain narrow pattern.

[0005] US 4 371 448 A, EP 0 750 033 A1, EP 0 617116 A1, US 5 5750 407 and WO2012/003117A1 discloses each functional fluids based on borate esters which are used as brake fluids. There is a strong demand for improved high performance hydraulic fluid compositions and brake fluids having low temperature viscosity while meeting or exceeding at the same time the minimum ERBP and especially the WERBP temperature requirements as fulfilled by the hydraulic fluid compositions and brake fluids described in the art.

45 According to the present invention, the above-defined functional fluid composition has been found which exhibits superior values of ERBP and of WERBP and for low temperature kinematic viscosity while maintaining excellent resistance to corrosion, high stability and meeting other physical property requirements such as pH, reserve alkalinity and rubber swell. Especially very high WERBP values are achieved. Moreover, kinematic viscosity value at very low temperatures below -40°C, e.g. at -50°C, are superior compared to functional fluid compositions of the art.

The alkylamine ethoxylates as part of component (C) and their interaction with the other components and additives of the present functional fluid composition are deemed to be responsible for the superior performance and especially for the very high WERBP values.

55 The alkylamine residue in the said alkylamine ethoxylates may be a secondary or preferably a primary aliphatic monoamine which is capable of being ethoxylated. Usually secondary or preferably primary aliphatic monoamines are used, however, polyamines with with at least one secondary and/or primary amino group which is capable of being ethoxylated may also be used.

[0006] The alkylamine ethoxylates comprise at least one linear C₆ to C₁₃ alkyl chain, more preferably at least one linear C₇ to C₁₂ alkyl chain, most preferably at least one linear C₈ to C₁₁ alkyl chain. The alkylamine ethoxylates may also comprise mixtures of such alkyl chains, for example a mixture of homologue alkyl residues, depending on the specific technical or natural origin of the alkylamines used.

[0007] Suitable examples for single alkylamine molecules being capable for ethoxylation and, therefore, suitable as surfactants for the instant invention are n-hexylamine, n-heptylamine, n-octylamine, n-nonylamine, n-decylamine, n-undecylamine, n-dodecylamine, n-tridecylamine, di-(n-hexyl)amine, n-hexylmethylamine, n-heptylmethylamine, n-octylmethylamine, n-nonylmethylamine, n-decylmethylamine, n-undecylmethylamine, n-dodecylmethylamine, n-tridecylmethylamine,.

[0008] Such alkyl residues may be derived entirely from petrochemical production, for example technical C₈-C₁₅ alkyl mixtures, or may entirely or partially be based on renewable raw materials, for example fatty amines may be used as the basis for the alkylamine ethoxylates.

[0009] The degree of ethoxylation is from 1.5 to 15 EO units, more preferable from 1.8 to 9 EO units, most preferably from 2 to 6 EO units. The said ethoxylation degree is a statistical value, i.e the alkylamine ethoxylates have normally to be regarded as mixtures of species (homologues) with different numbers of EO units.

[0010] In the instant invention, the at least one alkylamine ethoxylate comprises at least one linear C₆ to C₁₃ alkyl chain and from 1.5 to 15 EO units; most preferably the at least one alkylamine ethoxylate comprises at least one linear C₇ to C₁₂ alkyl chain and from 1.8 to 9 EO units, especially the at least one alkylamine ethoxylate comprises at least one linear C₈ to C₁₁ alkyl chain and from 2 to 6 EO units.

Such alkylamine ethoxylates may be primary amines with one oxyethylene chain of general formula Alkyl-NH-(CH₂CH₂O)_m-H or primary amines with two oxyethylene chains of general formula Alkyl-N[(CH₂CH₂O)_p-H][(CH₂CH₂O)_q-H] or secondary amines of general formula (Alkyl)₂N-(CH₂CH₂O)_m-H or mixtures of such primary amines with one oxyethylene chain and such primary amines with two oxyethylene chains or mixtures of such primary and secondary amines, wherein m and (p+q), respectively, are the total ethoxylation degrees. "Alkyl" in the above formulas normally means C₆ to C₁₃ alkyl, more preferably C₇ to C₁₂ alkyl, most preferably C₈ to C₁₁ alkyl, as defined above. Residual alkylamine species may also be present in lower amounts, especially with low total ethoxylation degrees below 2. A typical suitable alkylamine ethoxylate is octylamine (caprylamine) with 2 EO units which is commercially available.

The said alkylamine ethoxylates can be prepared by usual methods such as the reaction of the alkylamine with ethylene oxide under catalysis by alkali metal hydroxides or under catalysis by double metal cyanides, as known to the skilled person in the art.

The said alkylamine ethoxylates has partly corrosion inhibition properties and partly solvent properties for the functional fluid composition or brake fluid, respectively, according to the present invention.

[0011] Component (A) of the functional fluid composition of general formula (I) comprises species of ethoxylation degree of from n = 2 to n = 6, preferably of from n = 2 to n = 4, more preferably of n = 3. Component (A) may be a single species or a mixture of different species with regard to the ethoxylation degree and/or to radical R¹. Radical R¹ is preferably a C₁- to C₄-alkyl radical and may be methyl, ethyl, n-propyl, isopropyl, n-butyl, isobutyl, sec-butyl, tert-butyl, n-pentyl, n-hexyl, n-heptyl, n-octyl and 2-ethylhexyl, ethyl and especially methyl being preferred.

The said borate esters and their methods of preparation are well known in the art. Borate esters especially useful in the functional fluid composition of the present invention may be prepared by reacting boric acid with suitable alkoxy glycol components which are different or identical to those of component (B). Typically, such alkoxy glycol components are mixtures of different species with regard to the ethoxylation degree and/or to radical R¹.

[0012] Examples of useful borate esters include those containing methyl triethylene glycol borate ester which can also be named tris-[2-[2-(2-methoxyethoxy)-ethoxy]-ethyl] orthoborate, ethyl triethylene glycol borate ester, n-butyl triethylene glycol borate ester and mixtures thereof. Further useful borate esters include those containing methyl tetraethylene glycol borate ester, methyl diethylene glycol borate ester, ethyl tetraethylene glycol borate ester, ethyl diethylene glycol borate ester, n-butyl tetraethylene glycol borate ester, n-butyl diethylene glycol borate ester and mixtures thereof.

[0013] In a preferred embodiment, component (A) comprises at least one alkoxy glycol borate ester of general formula (I) wherein the ethoxylation degree has a value of n = 3 and R¹ is a methyl radical.

Component (B) of the functional fluid composition of general formula (II) comprises species of ethoxylation degree of from m = 2 to m = 6, preferably of from m = 2 to m = 4. Component (B) may be a single species or a mixture of different species with regard to the ethoxylation degree and/or to radical R². Radical R² is preferably a C₁- to C₄-alkyl radical and may be methyl, ethyl, n-propyl, isopropyl, n-butyl, isobutyl, sec-butyl, tert-butyl, n-pentyl, n-hexyl, n-heptyl, n-octyl and 2-ethylhexyl, ethyl and especially methyl being preferred.

Examples of useful alkoxy glycols for component (B) of the present invention include methyldiglycol, methyltriglycol, methyltetraglycol, methylpentaglycol, methylhexaglycol, ethyldiglycol, ethyltriglycol, ethyltetraglycol, ethylpentaglycol, ethylhexaglycol, n-propyldiglycol, n-propyltriglycol, n-propyltetraglycol, n-propylpentaglycol, n-propylhexaglycol, n-butyldiglycol, n-butyltriglycol, n-butyltetraglycol, n-butylpentaglycol, n-butylhexaglycol, n-pentyldiglycol, n-pentyltriglycol, n-pentyltetraglycol, n-pentylpentaglycol, n-pentylhexaglycol, n-hexyldiglycol, n-hexyltriglycol, n-hexyltetraglycol, n-hex-

ylpentaglycol, n-hexylhexaglycol, 2-ethylhexyldiglycol, 2-ethylhexyltriglycol, 2-ethylhexyltetraglycol, 2-ethylhexylpentaglycol, 2-ethylhexylhexaglycol and mixtures thereof. For the avoidance of doubt, "glycol" always means "ethylene glycol".

[0014] The component (B) comprises a mixture of alkoxy glycols of general formula (II) comprising solely or predominantly species with $m = 3$. Predominantly means that at least 60% by weight, more preferably at least 75% by weight, most preferably at least 90% by weight, of component (B) comprises species with $m = 3$. In the last case, alkoxy glycol species with $m = 2$ and/or $m = 4$ and/or $m = 5$ and/or $m = 6$ may be present in minor amounts.

A preferred mixture of such alkoxy glycols for component (B) with $m = 3$ is a mixture consisting solely or essentially of methyltriglycol and n-butyltriglycol. Typically, the weight ratio of methyltriglycol to n-butyltriglycol in this mixture is from 5 : 1 to 1 : 2, especially from 2 : 1 to 1 : 1.

Component (C) of the present functional fluid composition may comprise, besides the alkylamine ethoxylates, at least one additive with corrosion inhibition action, although the alkylamine ethoxylates exhibit corrosion inhibition properties themselves. Suitable customary additives with corrosion inhibition properties include fatty acids such as lauric, palmitic, stearic or oleic acid; esters of phosphorus or phosphoric acid with aliphatic alcohols; phosphites such as ethyl phosphate, dimethyl phosphate, isopropyl phosphate, n-butyl phosphate, triphenyl phosphite and diisopropyl phosphite; heterocyclic nitrogen containing organic compounds such as benzotriazole, toluotriazole, 1,2,4-triazole, benzoimidazole, purine, adenine and derivatives of such heterocyclic organic compounds; alkylamines such as mono- and di-(C₄- to C₂₀-alkyl)amines, e.g. n-butylamine, n-hexylamine, n-octylamine, 2-ethylhexylamine, isononylamine, n-decylamine, n-dodecylamine, oleylamine, d-n-proylamine, di-isopropylamine, di-ni-butylamine, di-n-amylamine, cyclohexylamine and salts of such alkylamines; alkanolamines such as mono-, di- and trimethanolamine, mono-, di- and triethanolamine, mono-, di- and tri-n-propanolamine and mono-, di- and tri-isopropanolamine. Of course, mixtures of the above additives with corrosion inhibition action can be used.

[0015] Using alkylamines and/or alkanolamines as compounds with corrosion inhibition action in the additive package of component (C) often results in an additional decrease in viscosity of the present functional fluid composition.

[0016] Besides the alkylamine ethoxylates and possibly the additives with corrosion inhibition action, further customary additives may be present in the additive package of component (C), for example stabilizers such as pH stabilizers, antioxidants such as phenol-thiazine and phenolic compounds, e.g. hydroxyanisol and bisphenol A, defoamers and dyes.

[0017] Preferably, the additive package of component (C) which includes one or more alkylamine ethoxylates consists or consists essentially of a major portion of additives with corrosion inhibition action and a minor portion of additives with antioxidant action and possibly of defoamers and dyes. The portion of alkylamine ethoxylate(s) in the additive package of component (C) is typically of from 1 to 100% by weight, preferably of from 10 to 99% by weight, more preferably of from 25 to 98% by weight, most preferably of from 40 to 97% by weight, each based on the weight of the additive package of component (C).

[0018] It is contemplated that also other materials than components (A), (B) and (C) may be formulated into the present functional fluid composition so long as care is taken not to lower the ERBP or WERBP temperatures below the superior high levels of the instant invention or to increase the low temperature viscosity above an acceptable level. For example, the present functional fluid composition may include from 0 to 20% by weight, based on the total weight of the composition, of a diluent or a lubricant such as, for example, polyethylene oxides, polypropylene oxides, poly(C₄- to C₁₀-alkylene) oxides, dialkoxyglycols or borate co-esters.

[0019] According to the present invention, the three components (A), (B) and (C) are present in the functional fluid composition in the following amounts:

(A) from 30 to 75% by weight, more preferably from 45 to 65% by weight, most preferably from 56 to 62% by weight;

(B) from 20 to 65% by weight, more preferably from 32 to 52% by weight, most preferably from 36 to 42% by weight;

(C) from 0.5 to 7% by weight, more preferably from 1 to 4% by weight, most preferably from 1.5 to 2.5% by weight.

[0020] All % values for (A), (B) and (C) above refer to the total composition of the present functional fluid composition, or - if other materials than components (A), (B) and (C), e.g. the above-mentioned diluents and/or lubricants, are present - to the total weight of (A) plus (B) plus (C). The % values for (A), (B) and (C) add up in each case to 100% by weight. The functional fluid composition of the present invention exhibits superior behavior in ERBP and WERBP temperature and simultaneously in low temperature viscosity performance. It exhibits a ERBP of at least 270°C, and a WERBP of at least 180°C, more preferably of at least 182°C, still more preferably of at least 184°C, most preferably of at least 187°C. The functional fluid composition of the present invention exhibits a low temperature kinematic viscosity of less than 700 centistokes ("cSt") (= mm²/s), more preferably of less than 685 cSt, most preferably less than 675 cSt, each determined at a temperature of -40°C.

The functional fluid composition of the present invention exhibits a low temperature kinematic viscosity of less than 4000

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cSt, more preferably of less than 3000 cSt, most preferably less than 2600 cSt, each determined at a temperature of -50°C, whereas typical functional fluid compositions of the art exhibit low temperature kinematic viscosities in the region from about 4500 cSt to about 6000 cSt at -50°C.

The low viscosity functional fluid composition of the present invention is especially useful as a brake fluid, for example for vehicles such as passenger cars and trucks, especially for new electronic or automated anti-lock brake systems which require lower viscosity fluids for satisfactory operation at low temperatures.

Besides its superior behavior in ERBP and WERBP temperature and its low temperature viscosity performance, the functional fluid composition of the present invention exhibits a good corrosion protection, a good water compatibility, a mild pH value, a good stability with regard to low and high temperatures, a good oxidation stability, a good chemical stability, a good behavior towards rubber and elastomers and a good lubrication performance.

[0021] The following examples are intended to demonstrate the behavior and performance of the low temperature functional fluid composition of the present invention without limiting it.

Examples

[0022] The ERBP and WERBP temperatures and kinematic viscosity values of the following function fluid compositions according to the present invention ("FFC1" and "FFC2") were determined according to test procedures described in Department of Transportation Standard FMVSS 116 (corresponding to SAE J 1704). For comparison, the corresponding values of Example 8 of WO 02/38711 ("FFC3"), which is the example with the highest WERPB (i.e. 186°C) in this document the values therefor having also been determined according to FMVSS 116, are confronted to FFC1 and FFC2.

Compositions of FFC1, FFC2 and FFC3 [% by weight]:

	FFC1	FFC2	FFC3
Methyl triethylene glycol borate ester	61.00	61.00	61.00
Methyl triethylene glycol	20.00	20.00	30.50
n-Butyl triethylene glycol	17.345	17.145	2.00
Ethyl triethylene glycol	0	0	2.50
Hexyl diethylene glycol	0	0	2.00
Diisopropanolamine	0	1.00	2.00
Octylamine ethoxylate (2 EO units)	1.60	0.80	0
Tolutriazol	0.05	0.05	0
Ester of phosphoric acid	0.005	0.005	0

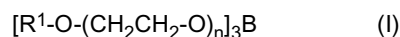
ERBP, WERBP and kinematic viscosity of FFC1, FFC2 and FFC3:

	ERBP [°C]	WERBP [°C]	kinematic viscosity (-40°C) [cSt]
FCC1	277	189	659
FCC2	274	188	670
For comparison:			
FCC3	265	186	681
FCC2		kinematic viscosity (-50°C) [cSt]:	2523

Claims

1. A functional fluid composition comprising

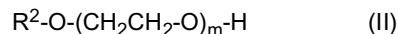
(A) from 30 to 75% by weight, based on the weight of the total composition, of one or more alkoxy glycol borate esters having the general formula (I)



wherein R¹ is a C₁- to C₈-alkyl radical or a mixture of such radicals and n has a value of from 2 to 6,

(B) from 20 to 65% by weight, based on the weight of the total composition, a mixture of alkoxy glycol components having the general formula (II)

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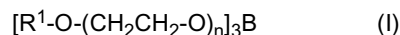
5 wherein R^2 is a C_1 - to C_8 -alkyl radical or a mixture of such radicals and m has a value of from 2 to 6, R^2 and/or m being different or identical to R^1 and/or n , respectively, comprising at least 60% by weight species with $m = 3$ (C) from 0.5 to 7% by weight, based on the total weight of the composition, of an additive package comprising one or more additives with corrosion inhibition action, wherein at least one of the additives contained in the additive package of component (C) is selected from alkylamine ethoxylates which comprise at least one linear C_6 to C_{13} alkyl chain and from 1.5 to 15 EO units exhibiting a low temperature kinematic viscosity of less than 700 centistokes, determined at a temperature of -40°C and exhibiting a dry equilibrium reflux boiling point (ERBP) of at least 270°C and a wet equilibrium reflux boiling point (WERBP) of at least 180°C .

- 15 2. The functional fluid composition according to Claim 1, wherein the at least one alkylamine ethoxylate contained in component (C) comprises at least one linear C_7 to C_{12} alkyl chain and from 1.8 to 9 ethylene oxide units.
3. The functional fluid composition according to Claims 1 to 2, wherein the at least one alkylamine ethoxylate contained in component (C) comprises at least one linear C_8 to C_{11} alkyl chain and from 2 to 6 ethylene oxide units.
- 20 4. The functional fluid composition according to Claims 1 to 3, wherein the at least one alkylamine ethoxylate contained in component (C) comprises octylamine with 2 ethylene oxide units.
5. The functional fluid composition according to Claims 1 to 4, wherein component (A) comprises at least one alkoxy glycol borate of general formula (I) wherein n has a value of from 2 to 4.
- 25 6. The functional fluid composition according to Claims 1 to 5, wherein component (A) comprises at least one alkoxy glycol borate of general formula (I) wherein n has a value of 3 and R^1 is a methyl radical.
7. The functional fluid composition according to Claims 1 to 6, wherein the mixture alkoxy glycols for component (B) with $m = 3$ is a mixture comprising at least 75% by weight methyltriglycol and n -butyltriglycol.
- 30 8. The functional fluid composition according to Claim 7, wherein the weight ratio of methyltriglycol to n -butyltriglycol in this mixture is from 5 : 1 to 1 : 2.
9. The use of the functional fluid according to Claims 1 to 8 as a brake fluid.

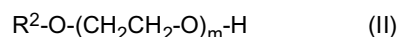
Patentansprüche

- 40 1. Funktionelle Fluidzusammensetzung, umfassend

(A) von 30 - 75 Gew.-%, bezogen auf das Gewicht der gesamten Zusammensetzung, von einem oder mehreren Alkoxyglykolboratesteren mit der allgemeinen Formel (I)



45 worin R^1 ein C_1 - bis C_8 -Alkylrest oder eine Mischung von solchen Resten ist und n einen Wert von 2 bis 6 hat, (B) von 20 bis 65 Gew.-%, bezogen auf das Gewicht der gesamten Zusammensetzung, einer Mischung von Alkoxyglykolkomponenten mit der allgemeinen Formel (II)



50 worin R^2 ein C_1 - bis C_8 -Alkylrest oder eine Mischung von solchen Resten ist und m einen Wert von 2 bis 6 hat, R^2 und/oder m unterschiedlich oder gleich zu R^1 sind und/oder n mindestens 60 Gew.-% an Spezies mit $m = 3$ umfasst,

55 (C) von 0,5 bis 7 Gew.-%, bezogen auf das gesamte Gewicht der Zusammensetzung, eines Additivpakets, umfassend ein oder mehrere Additive mit Korrosionshemmwirkung, wobei mindestens eines der Additive, das in dem Additivpaket der Komponente (C) enthalten ist, aus Alkylaminethoxylaten gewählt wird, welche mindestens eine lineare C_6 - bis C_{13} -Alkylkette und 1,5 bis 15 EO-Einheiten umfassen,

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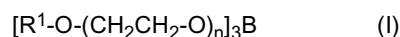
die eine kinematische Niedrigtemperatur-Viskosität von weniger als 700 Centistokes zeigt, welche bei einer Temperatur von -40 °C bestimmt wird, und die einen Trocken-Gleichgewichts-Rückfluss-Siedepunkt (ERBP) von mindestens 270 °C und einen Nass-Gleichgewichts-Rückfluss-Siedepunkt (WERBP) von mindestens 180 °C zeigt.

- 5
2. Funktionelle Fluidzusammensetzung gemäß Anspruch 1, wobei das mindestens eine Alkylaminethoxylat, welches in der Komponente (C) enthalten ist, mindestens eine lineare C₇- bis C₁₂-Alkylkette und 1,8 bis 9 Ethylenoxid-Einheiten umfasst.
- 10
3. Funktionelle Fluidzusammensetzung gemäß Anspruch 1 bis 2, wobei das mindestens eine Alkylaminethoxylat, welches in der Komponente (C) enthalten ist, mindestens eine lineare C₈- bis C₁₁-Alkylkette und 2 bis 6 Ethylenoxid-Einheiten umfasst.
- 15
4. Funktionelle Fluidzusammensetzung gemäß Anspruch 1 bis 3, wobei das mindestens eine Alkylaminethoxylat, welches in der Komponente (C) enthalten ist, Octylamin mit 2 Ethylenoxid-Einheiten umfasst.
5. Funktionelle Fluidzusammensetzung gemäß Anspruch 1 bis 4, wobei die Komponente (A) mindestens ein Alkoxyglycolborat der allgemeinen Formel (I), wobei n einen Wert von 2 bis 4 aufweist, umfasst.
- 20
6. Funktionelle Fluidzusammensetzung gemäß Anspruch 1 bis 5, wobei die Komponente (A) mindestens ein Alkoxyglycolborat der allgemeinen Formel (I), wobei n einen Wert von 3 aufweist und R¹ ein Methylrest ist, umfasst.
7. Funktionelle Fluidzusammensetzung gemäß Anspruch 1 bis 6, wobei die Mischung von Alkoxyglycolen für die Komponente (B) mit m = 3 eine Mischung ist, die mindestens 75 Gew.-% Methyltriglycol und n-Butyltriglycol umfasst.
- 25
8. Funktionelle Fluidzusammensetzung gemäß Anspruch 7, wobei das Gewichtsverhältnis von Methyltriglycol zu n-Butyltriglycol in dieser Mischung 5 : 1 bis 1 : 2 beträgt.
9. Verwendung des funktionellen Fluids gemäß den Ansprüchen 1 bis 8 als eine Bremsflüssigkeit.
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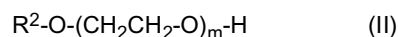
Revendications

1. Composition de fluide fonctionnel comprenant

35 (A) de 30 à 75 % en poids, sur la base du poids de la composition totale, d'un ou plusieurs esters de borate d'alcoxyglycol ayant la formule générale (I)



40 dans laquelle R¹ est un radical alkyle en C₁ à C₈ ou un mélange de tels radicaux et n a une valeur de 2 à 6, (B) de 20 à 65 % en poids, sur la base du poids de la composition totale, d'un mélange de composants d'alcoxyglycol ayant la formule générale (II)



45 dans laquelle R² est un radical alkyle en C₁ à C₈ ou un mélange de tels radicaux et m a une valeur de 2 à 6, R² et/ou m étant différents de, ou identiques à, R¹ et/ou n, respectivement, comprenant au moins 60 % en poids d'espèces avec m = 3

50 (C) de 0,5 à 7 % en poids, sur la base du poids total de la composition, d'un système d'additif comprenant un ou plusieurs additifs ayant une action d'inhibition de la corrosion, au moins un des additifs contenus dans le système d'additifs du composant (C) étant choisi parmi des éthoxylates d'alkylamine qui comprennent au moins une chaîne alkyle linéaire en C₆ à C₁₃ et de 1,5 à 15 motifs d'oxyde d'éthylène (EO) présentant une viscosité cinématique à basse température inférieure à 700 centistokes, déterminée à une température de -40 °C et

55 présentant un point d'ébullition à reflux à l'équilibre à sec (ERBP) d'au moins 270 °C et un point d'ébullition à reflux à l'équilibre humide (WERBP) d'au moins 180 °C.

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2. Composition de fluide fonctionnel selon la revendication 1, dans laquelle l'au moins un éthoxylate d'alkylamine contenu dans le composant (C) comprend au moins une chaîne alkyle linéaire en C₇ à C₁₂ et de 1,8 à 9 motifs d'oxyde d'éthylène.
- 5 3. Composition de fluide fonctionnel selon les revendications 1 à 2, dans laquelle l'au moins un éthoxylate d'alkylamine contenu dans le composant (C) comprend au moins une chaîne alkyle linéaire en C₈ à C₁₁ et de 2 à 6 motifs d'oxyde d'éthylène.
- 10 4. Composition de fluide fonctionnel selon les revendications 1 à 3, dans laquelle l'au moins un éthoxylate d'alkylamine contenu dans le composant (C) comprend de l'octylamine avec 2 motifs d'oxyde d'éthylène.
- 5 15 5. Composition de fluide fonctionnel selon les revendications 1 à 4, dans laquelle le composant (A) comprend au moins un borate d'alcoxyglycol de formule générale (I) dans lequel n a une valeur de 2 à 4.
- 15 6. Composition de fluide fonctionnel selon les revendications 1 à 5, dans laquelle le composant (A) comprend au moins un borate d'alcoxyglycol de formule générale (I) dans lequel n a une valeur de 3 et est un radical méthyle.
- 20 7. Composition de fluide fonctionnel selon les revendications 1 à 6, dans laquelle le mélange d'alcoxyglycols pour le composant (B) avec m = 3 est un mélange comprenant au moins 75 % en poids de méthyltriglycol et de n-butyltriglycol.
- 20 8. Composition de fluide fonctionnel selon la revendication 7, dans laquelle le rapport en poids du méthyltriglycol au n-butyltriglycol dans ce mélange est de 5:1 à 1:2.
- 25 9. Utilisation du fluide fonctionnel selon les revendications 1 à 8 en tant que liquide de frein.

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REFERENCES CITED IN THE DESCRIPTION

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