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(54) **Use of organic carbonates as solvents for the washing of metal surfaces**

Verwendung von organischen Karbonaten als Lösungsmittel zur Reinigung von Metalloberflächen

Utilisation de carbonates organiques comme solvants pour le lavage de surfaces métalliques

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(56) References cited:
WO-A-99/57217 **US-A- 4 680 133**
US-A- 5 204 026 **US-A- 5 514 221**

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Description

Description for the following Contracting States: CH, LI, CY, ES, GR, LU, MC, PT, SE

[0001] As is known, the processing of metals (cutting, polishing, forming) as also processing in the oil drilling field, require the use of auxiliary fluids which generally consist of a mineral or synthetic oil as such or emulsified, optionally charged with solids (pastes, mud).

[0002] The residues of the processing fluid must be removed at the end of the processing, before passing to a subsequent phase where their presence would prevent its feasibility.

[0003] In the mechanical industry, for the washing of finished or semi-finished metal products contaminated by oils, emulsions and polishing pastes, non-flammable solvents are used, such as for example chlorinated products, which are toxic for the persons using them and also particularly harmful for the environment owing to the poor biodegradability and their high ozone consumption potential (ODP) (B.P. Whim, B.G. Johnson "Directory of solvents" page 173, 1997).

[0004] In the oil drilling field, steel pipes (casings) which are lowered into the well in the presence of oil mud must be washed before passing to the cementing phase.

[0005] In this case the washing of the mud-contaminated surfaces with solvents is at present carried out using solvents which are volatile, toxic, flammable, non-biodegradable and with a high content of aromatics such as carbon-naphtha, for example.

[0006] As far as the safety of the work-site and workers who are exposed to these solvents, is concerned, the competent authorities are issuing increasingly strict regulations and criteria for the production and use of solvents, but it is evident that the use of effective solvents which are non-flammable, atoxic, eco-compatible (biodegradable with a low ODP) and with a low volatility, not only provides a real solution to problems relating to personnel safety and respect for the environment, but also presents greater simplicity in the use, conservation and disposal of these solvents, which is reflected in the operating costs.

[0007] In accordance with this, great necessity is felt in the solvent field for the use of solvents which satisfy the above requisites at acceptable costs for application on an industrial scale. The chemical industry is therefore making considerable efforts to supply adequate solvents, as an alternative to the traditional ones.

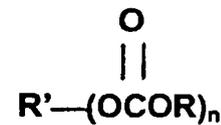
[0008] Examples are disclosed in WO 99/57217 which concerns cleaning metal surfaces using compositions containing organic solvents as methyl neopentyl carbonate, methyl t-butyl carbonate, methyl sec-butyl carbonate and di-isopropyl carbonate, while US-A-5,209,026 discloses a cleaning solvent having an extended shelf life including ethylene dipropionate and at least one alicyclic carbonate, preferably propylene carbonate, with or without other additives.

[0009] It has now been found that organic carbonates can be effectively used as solvents for the washing in an open system of metal surfaces contaminated by fluids such as mineral oils, synthetic oils or their emulsions o/w optionally charged with solids, in order to obtain auxiliary fluids in the form of pastes or mud.

[0010] The present invention therefore relates to the use of organic carbonates as solvents for the washing of metal surfaces, according to claim 1.

[0011] The invention also relates to a process for the washing of metal surfaces which consists in applying the solvent based on organic carbonates to metal surfaces and under suitable conditions for removing the contaminants present from the surfaces.

[0012] In particular, the organic carbonates described in the invention are represented by the following formula:



wherein:

n = 1-4

R and R' are two linear or branched alkyl radicals which contain a number of carbon atoms whose sum is equal to at least 5 and which can be the same or different.

[0013] Examples of carbonates which can be used for the invention are: methyl n-butyl carbonate, methyl n-pentyl carbonate, methyl iso-octyl carbonate, di-iso-propyl carbonate, di-n-propyl carbonate, di-n-butyl carbonate, di-iso-propyl carbonate, di-iso-octyl carbonate.

[0014] The general characteristics of the di-alkyl carbonates object of the invention are: low solubility in water which is always less than 1,000 ppm and therefore also an excellent hydrolytic stability, Kauri-Butanol index equal to at least 150, flash point higher than 55°C, boiling point higher than 145°C at atmospheric pressure.

[0015] The advantages obtained from using organic carbonates in this type of application are: effectiveness in removing contaminants, simplification of the equipment which uses them i.e. being able to operate in an open system as the emissions produced, owing to their characteristics (biodegradability, low ODP and atoxic) and their reduced quantity, do not create any problems either for human beings or for the environment.

[0016] In accordance with this, they can therefore also be used in offshore drilling activities, such as for example, in the washing of casings where, in practice, a substantial hydrolytic stability of the solvent and in any case the non-toxicity of its degradation products are also required.

[0017] Corrosion inhibitors, non-ionic wetting agents

and water for their application in emulsion, can optionally be added to the organic carbonates, object of the invention.

[0018] The solvents, object of the invention, are based on di-alkyl carbonates.

[0019] If these are produced by the trans-esterification of dimethylcarbonate (DMC) with higher alcohols, they are without halogens and free acidity deriving therefrom.

[0020] The alcohols which can be used for producing the di-alkyl carbonates object of the invention, have C₃-C₂₅ chains.

[0021] A criterion however, for selecting the alcohol, to ensure absolute compatibility of the di-alkyl carbonate deriving therefrom, also in the presence of traces of residual free synthesis alcohol and/or deriving from the degradation of the ester during use, is provided by the toxicological and eco-toxicological characteristics deriving from the structure of the alcohol itself.

[0022] Symmetrical or asymmetrical carbonates can be obtained when mixtures of at least two alcohols are fed to the trans-esterification.

[0023] In a preferred embodiment, the di-alkyl carbonate can be di-n-butyl carbonate (DnBC) or di-iso-octyl carbonate (DiOC) or their mixtures.

[0024] The solvent, object of the present invention, is preferably used pure as such, or is formulated to be subsequently applied in aqueous emulsion.

[0025] The formulate may optionally contain a corrosion inhibitor, a co-solvent and an emulsifying agent; it is generally preferable in the preparation of the formulate for the weight fraction of each of the additives not to exceed 20% w of the formulate.

[0026] The corrosion inhibitor can be selected from the group of amino-alcohols having tertiary nitrogen, such as for example, tri-ethanol (TEA).

[0027] The co-solvent can be selected from the group of glycol ethers; examples of co-solvent comprise propylene glycol methylether (PM), di-propylene glycol methylether (DPM) or di-propylene glycol n-butyl ether (DPNB).

[0028] The emulsifying agent can be selected from the group of non-ionic surface active agents, from the group of ethoxylated alcohols or acids, preferably using those of the C₉-C₁₈ aliphatic series which optimize the hydrophilic/lipophilic (HLB) ratio which characterizes them.

[0029] The conditions under which the washing of metal surfaces, object of the present invention, is carried out, can vary.

[0030] The washing is generally carried out at atmospheric pressure within a temperature range of 20°C to a maximum which is close to, but without exceeding, the flash point of the di-alkyl carbonate used.

[0031] The means of applying the solvent to the item to be washed, are not critical; in most cases simple immersion in a tank which does not necessarily have to be thermostat-regulated, is sufficient.

[0032] Mechanical actions such as manual application or spraying or also the use of ultra-sounds reduce the

time required for the washing.

[0033] It should be noted however that the contact time required by the solvent also depends on a series of factors, such as the type of oil/grease to be removed, the formulation which contains it and the aging of the contaminant especially if in paste or mud form.

[0034] The contact times generally range from less than a minute to an hour; longer contact times however can be adopted without there being any risk of ruining the surface to be treated.

[0035] The following examples are illustrative and do not limit the scope of the invention in any way.

EXAMPLE 1

[0036] Di-normal butyl carbonate (DnBC) was used with a purity of over 99% w for the washing at 40°C of the surface of metal test-samples contaminated by residues/crusts of the drilling auxiliary consisting of an inverse emulsion mud containing barite prepared using a mineral oil with a very low content of aromatic hydrocarbons.

[0037] The filtrate reducer and wetting agent were dosed in excess with respect to the standard, to provide a tighter adhesion of the mud onto the steel.

[0038] The mud thus prepared was characterized by an oil/water ratio equal to 90/10, a density of 2.1 Kg/lit, plastic viscosity (PV) of 54 cP, yield point (YP) of 14.5 gr/100cm².

[0039] The washing was effected by simple static immersion of the test-samples in the solvent.

[0040] Under these conditions, the complete removal of the contaminant from the metal surface of the test samples was obtained in 20 minutes.

EXAMPLE 2

[0041] The washing of metal test-samples carried out according to the procedure described in example 1 was effected using DnBC at 60°C. The complete removal of the contaminant from the surface was obtained in 8 minutes.

EXAMPLE 3

[0042] Di-normal butyl carbonate (DnBC) was used with a purity of over 99% w for the washing at 40°C of the surface of metal test-samples contaminated by residues/crusts of the drilling auxiliary consisting of an inverse emulsion mud containing barite prepared using gas oil.

[0043] The mud thus prepared was characterized by an oil/brine ratio equal to 75/25, a density of 1.47 Kg/lit, plastic viscosity (PV) of 23 cP, yield point (YP) of 2 gr/100cm².

[0044] The washing was effected by simple static immersion of the test-samples in the solvent.

[0045] Under these conditions, the complete removal

of the contaminant from the metal surface of the test samples was obtained in 3 minutes.

EXAMPLE 4

[0046] Di-normal butyl carbonate (DnBC) was used with a purity of over 99% w for the washing at 40°C of the surface of metal test-samples contaminated by residues/crusts of the drilling auxiliary consisting of an inverse emulsion mud containing barite prepared using a mineral oil with a low content of AF aromatics.

[0047] The mud thus prepared was characterized by an oil/brine ratio equal to 75/25, a density of 1.47 Kg/lit, a PV of 23 cP, a YP of 2 gr/100cm².

[0048] The washing was effected by simple static immersion of the test-samples in the solvent.

[0049] Under these conditions, the complete removal of the contaminant from the metal surface of the test samples was obtained in 3 minutes.

EXAMPLE 5

[0050] Di-normal butyl carbonate (DnBC) was used with a purity of over 99% w for the washing at 40°C of the surface of the rotor (metal cylinder having a diameter of about 3 cm and a height of about 8 cm) of a FANN 35 rotating viscometer. The test procedure included contamination of the rotor by immersing and rotating it for 5 minutes at 600 rpm in an inverse emulsion mud containing barite, prepared using a mineral oil with a low content of AF aromatics and characterized by an oil/water ratio equal to 90/10, a density of 1.9 Kg/lit.

[0051] The mud which had not adhered to the rotor was left to drip for 2 minutes and the rotor was then washed by immersion and rotation at 200 rpm in the thermostat-heated solvent.

[0052] Under these conditions, the complete removal of the contaminant from the metal surface of the cylinder was obtained in 8 minutes.

EXAMPLE 6

[0053] The washing of the metal rotor, carried out according to the procedure described in example 5, was effected using DnBC at 60°C.

[0054] The complete removal of the contaminant from the surface of the rotor was obtained in 5 minutes.

EXAMPLE 7

[0055] For the washing of coarse frames for glasses made of Cu/Ni/Fe monel (DIN 17143) alloy and Cu/Ni/Zn alpaca (DIN 17663) alloy, coming from the polishing phase and contaminated by mineral oil mixed with coconut granulate, W powder, the following formulate was used:

DBC 40% w

Di-propylene glycol mono methyl ether (DPM) 30% w
Tri-ethanol amine (TEA) 10% w
Mixture of C₁₂/C₁₅ alcohols ethoxylated with 7 moles of ETO: 20%

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[0056] About 4 liters of formulate were diluted with 36 lit of water and poured into a tank thermostat-regulated at 70°C where the frames, placed in baskets, were immersed in the liquid under continuous rocking.

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[0057] Ultra-sounds were applied to the liquid with an overall power of 800 Watts.

[0058] The complete removal of the contaminants was obtained in 15 minutes of treatment.

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EXAMPLE 8

[0059] For the washing of decorative items contaminated by polishing pastes (necklaces and brooches) made of Silver plating, the formulate was used under the conditions described in Example 7. The complete removal of the contaminants was obtained in 20 minutes of treatment.

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EXAMPLE 9

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[0060] For the washing of brass buckles contaminated by polishing pastes, di-normal butyl carbonate (DnBC) was used with a purity of over 99% w. The buckles (several tens) were placed in baskets which were immersed in a tank containing about 40 liters of liquid and were kept there in a static position.

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[0061] Ultra-sounds were applied to the liquid, thermostat-regulated at 40°C, with an overall power of 800 Watts.

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[0062] The complete removal of the contaminants was obtained in 10 minutes of treatment.

EXAMPLE 10 (comparative with 1)

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[0063] The washing of metal test-samples carried out according to the procedure described in example 1, was effected using a conventional solvent (carbon-naphtha) consisting of aromatic hydrocarbons. The complete removal of the contaminants from the metal surface of the test-samples was obtained in 15 minutes.

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EXAMPLE 11 (comparative with 4)

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[0064] The washing of metal test-samples carried out according to the procedure described in example 4, was effected using a conventional solvent (carbon-naphtha) consisting of aromatic hydrocarbons. The complete removal of the contaminants from the metal surface of the test-samples was obtained in 5 minutes.

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EXAMPLE 12 (comparative with 6)

[0065] The washing of metal test-samples carried out

according to the procedure described in example 6, was effected using a conventional solvent consisting of aromatic hydrocarbons and terpene derivatives. The complete removal of the contaminants from the metal surface of the test-samples was obtained in 2 minutes.

Description for the following Contracting States: AT, BE, DE, DK, FI, FR, GB, IE, IT, NL

[0066] As is known, the processing of metals (cutting, polishing, forming) as also processing in the oil drilling field, require the use of auxiliary fluids which generally consist of a mineral or synthetic oil as such or emulsified, optionally charged with solids (pastes, mud).

[0067] The residues of the processing fluid must be removed at the end of the processing, before passing to a subsequent phase where their presence would prevent its feasibility.

[0068] In the mechanical industry, for the washing of finished or semi-finished metal products contaminated by oils, emulsions and polishing pastes, non-flammable solvents are used, such as for example chlorinated products, which are toxic for the persons using them and also particularly harmful for the environment owing to the poor biodegradability and their high ozone consumption potential (ODP) (B.P. Whim, B.G. Johnson "Directory of solvents" page 173, 1997).

[0069] In the oil drilling field, steel pipes (casings) which are lowered into the well in the presence of oil mud must be washed before passing to the cementing phase.

[0070] In this case the washing of the mud-contaminated surfaces with solvents is at present carried out using solvents which are volatile, toxic, flammable, non-biodegradable and with a high content of aromatics such as carbon-naphtha, for example.

[0071] As far as the safety of the work-site and workers who are exposed to these solvents, is concerned, the competent authorities are issuing increasingly strict regulations and criteria for the production and use of solvents, but it is evident that the use of effective solvents which are non-flammable, atoxic, eco-compatible (biodegradable with a low ODP) and with a low volatility, not only provides a real solution to problems relating to personnel safety and respect for the environment, but also presents greater simplicity in the use, conservation and disposal of these solvents, which is reflected in the operating costs.

[0072] In accordance with this, great necessity is felt in the solvent field for the use of solvents which satisfy the above requisites at acceptable costs for application on an industrial scale. The chemical industry is therefore making considerable efforts to supply adequate solvents, as an alternative to the traditional ones.

[0073] Examples are disclosed in WO 99/57217 which concerns cleaning metal surfaces using compositions containing organic solvents as methyl neopentyl carbonate, methyl t-butyl carbonate, methyl sec-butyl carbonate and di-isopropyl carbonate, while US-A-5,204,026 dis-

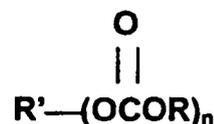
closes a cleaning solvent having an extended shelf life including ethylene dipropionate and at least one alicyclic carbonate, preferably propylene carbonate, with or without other additives.

[0074] It has now been found that organic carbonates can be effectively used as solvents for the washing in an open system of metal surfaces contaminated by fluids such as mineral oils, synthetic oils or their emulsions o/w optionally charged with solids, in order to obtain auxiliary fluids in the form of pastes or mud.

[0075] The present invention therefore relates to the use of organic carbonates as solvents for the washing of metal surfaces, according to claim 1.

[0076] The invention also relates to a process for the washing of metal surfaces which consists in applying the solvent based on organic carbonates to metal surfaces and under suitable conditions for removing the contaminants present from the surfaces.

[0077] In particular, the organic carbonates described in the invention are represented by the following formula:



wherein:

$$n = 1-4$$

R and R' are two linear or branched alkyl radicals which contain a number of carbon atoms whose sum is equal to at least 5 and which can be the same or different.

[0078] Examples of carbonates which can be used for the invention are: methyl n-butyl carbonate, methyl n-pentyl carbonate, methyl iso-octyl carbonate, di-n-propyl carbonate, di-n-butyl carbonate, di-iso-octyl carbonate.

[0079] The general characteristics of the di-alkyl carbonates object of the invention are: low solubility in water which is always less than 1,000 ppm and therefore also an excellent hydrolytic stability, Kauri-Butanol index equal to at least 150, flash point higher than 55°C, boiling point higher than 145°C at atmospheric pressure.

[0080] The advantages obtained from using organic carbonates in this type of application are: effectiveness in removing contaminants, simplification of the equipment which uses them i.e. being able to operate in an open system as the emissions produced, owing to their characteristics (biodegradability, low ODP and atoxic) and their reduced quantity, do not create any problems either for human beings or for the environment.

[0081] In accordance with this, they can therefore also be used in offshore drilling activities, such as for example,

in the washing of casings where, in practice, a substantial hydrolytic stability of the solvent and in any case the non-toxicity of its degradation products are also required.

[0082] Corrosion inhibitors, non-ionic wetting agents and water for their application in emulsion, can optionally be added to the organic carbonates, object of the invention.

[0083] The solvents, object of the invention, are based on di-alkyl carbonates.

[0084] If these are produced by the trans-esterification of dimethylcarbonate (DMC) with higher alcohols, they are without halogens and free acidity deriving therefrom.

[0085] The alcohols which can be used for producing the di-alkyl carbonates object of the invention, have C₃-C₂₅ chains.

[0086] A criterion however, for selecting the alcohol, to ensure absolute compatibility of the di-alkyl carbonate deriving therefrom, also in the presence of traces of residual free synthesis alcohol and/or deriving from the degradation of the ester during use, is provided by the toxicological and eco-toxicological characteristics deriving from the structure of the alcohol itself.

[0087] Symmetrical or asymmetrical carbonates can be obtained when mixtures of at least two alcohols are fed to the trans-esterification.

[0088] In a preferred embodiment, the di-alkyl carbonate can be di-n-butyl carbonate (DnBC) or di-iso-octyl carbonate (DiOC) or their mixtures.

[0089] The solvent, object of the present invention, is preferably used pure as such, or is formulated to be subsequently applied in aqueous emulsion.

[0090] The formulate may optionally contain a corrosion inhibitor, a co-solvent and an emulsifying agent; it is generally preferable in the preparation of the formulate for the weight fraction of each of the additives not to exceed 20% w of the formulate.

[0091] The corrosion inhibitor can be selected from the group of amino-alcohols having tertiary nitrogen, such as for example, tri-ethanol (TEA).

[0092] The co-solvent can be selected from the group of glycol ethers; examples of co-solvent comprise propylene glycol methylether (PM), di-propylene glycol methylether (DPM) or di-propylene glycol n-butyl ether (DPNB).

[0093] The emulsifying agent can be selected from the group of non-ionic surface active agents, from the group of ethoxylated alcohols or acids, preferably using those of the C₉-C₁₈ aliphatic series which optimize the hydrophilic/lipophilic (HLB) ratio which characterizes them.

[0094] The conditions under which the washing of metal surfaces, object of the present invention, is carried out, can vary.

[0095] The washing is generally carried out at atmospheric pressure within a temperature range of 20°C to a maximum which is close to, but without exceeding, the flash point of the di-alkyl carbonate used.

[0096] The means of applying the solvent to the item to be washed, are not critical; in most cases simple im-

mersion in a tank which does not necessarily have to be thermostat-regulated, is sufficient.

[0097] Mechanical actions such as manual application or spraying or also the use of ultra-sounds reduce the time required for the washing.

[0098] It should be noted however that the contact time required by the solvent also depends on a series of factors, such as the type of oil/grease to be removed, the formulation which contains it and the aging of the contaminant especially if in paste or mud form.

[0099] The contact times generally range from less than a minute to an hour; longer contact times however can be adopted without there being any risk of ruining the surface to be treated.

[0100] The following examples are illustrative and do not limit the scope of the invention in any way.

EXAMPLE 1

[0101] Di-normal butyl carbonate (DnBC) was used with a purity of over 99% w for the washing at 40°C of the surface of metal test-samples contaminated by residues/crusts of the drilling auxiliary consisting of an inverse emulsion mud containing barite prepared using a mineral oil with a very low content of aromatic hydrocarbons.

[0102] The filtrate reducer and wetting agent were dosed in excess with respect to the standard, to provide a tighter adhesion of the mud onto the steel.

[0103] The mud thus prepared was characterized by an oil/water ratio equal to 90/10, a density of 2.1 Kg/lit, plastic viscosity (PV) of 54 cP, yield point (YP) of 14.5 gr/100cm².

[0104] The washing was effected by simple static immersion of the test-samples in the solvent.

[0105] Under these conditions, the complete removal of the contaminant from the metal surface of the test samples was obtained in 20 minutes.

EXAMPLE 2

[0106] The washing of metal test-samples carried out according to the procedure described in example 1 was effected using DnBC at 60°C. The complete removal of the contaminant from the surface was obtained in 8 minutes.

EXAMPLE 3

[0107] Di-normal butyl carbonate (DnBC) was used with a purity of over 99% w for the washing at 40°C of the surface of metal test-samples contaminated by residues/crusts of the drilling auxiliary consisting of an inverse emulsion mud containing barite prepared using gas oil.

[0108] The mud thus prepared was characterized by an oil/brine ratio equal to 75/25, a density of 1.47 Kg/lit, plastic viscosity (PV) of 23 cP, yield point (YP) of 2 gr/

100cm².

[0109] The washing was effected by simple static immersion of the test-samples in the solvent.

[0110] Under these conditions, the complete removal of the contaminant from the metal surface of the test samples was obtained in 3 minutes.

EXAMPLE 4

[0111] Di-normal butyl carbonate (DnBC) was used with a purity of over 99% w for the washing at 40°C of the surface of metal test-samples contaminated by residues/crusts of the drilling auxiliary consisting of an inverse emulsion mud containing barite prepared using a mineral oil with a low content of AF aromatics.

[0112] The mud thus prepared was characterized by an oil/brine ratio equal to 75/25, a density of 1.47 Kg/lit, a PV of 23 cP, a YP of 2 gr/100cm².

[0113] The washing was effected by simple static immersion of the test-samples in the solvent.

[0114] Under these conditions, the complete removal of the contaminant from the metal surface of the test samples was obtained in 3 minutes.

EXAMPLE 5

[0115] Di-normal butyl carbonate (DnBC) was used with a purity of over 99% w for the washing at 40°C of the surface of the rotor (metal cylinder having a diameter of about 3 cm and a height of about 8 cm) of a FANN 35 rotating viscometer. The test procedure included contamination of the rotor by immersing and rotating it for 5 minutes at 600 rpm in an inverse emulsion mud containing barite, prepared using a mineral oil with a low content of AF aromatics and characterized by an oil/water ratio equal to 90/10, a density of 1.9 Kg/lit.

[0116] The mud which had not adhered to the rotor was left to drip for 2 minutes and the rotor was then washed by immersion and rotation at 200 rpm in the thermostat-heated solvent.

[0117] Under these conditions, the complete removal of the contaminant from the metal surface of the cylinder was obtained in 8 minutes.

EXAMPLE 6

[0118] The washing of the metal rotor, carried out according to the procedure described in example 5, was effected using DnBC at 60°C.

[0119] The complete removal of the contaminant from the surface of the rotor was obtained in 5 minutes.

EXAMPLE 7

[0120] For the washing of coarse frames for glasses made of Cu/Ni/Fe monel (DIN 17143) alloy and Cu/Ni/Zn alpaca (DIN 17663) alloy, coming from the polishing phase and contaminated by mineral oil mixed with coco-

nut granulate, W powder, the following formulate was used:

DBC 40% w

Di-propylene glycol mono methyl ether (DPM) 30% w

Tri-ethanol amine (TEA) 10% w

Mixture of C₁₂/C₁₅ alcohols ethoxylated with 7 moles of ETO: 20%

[0121] About 4 liters of formulate were diluted with 36 lit of water and poured into a tank thermostat-regulated at 70°C where the frames, placed in baskets, were immersed in the liquid under continuous rocking.

[0122] Ultra-sounds were applied to the liquid with an overall power of 800 Watts.

[0123] The complete removal of the contaminants was obtained in 15 minutes of treatment.

EXAMPLE 8

[0124] For the washing of decorative items contaminated by polishing pastes (necklaces and brooches) made of Silver plating, the formulate was used under the conditions described in Example 7. The complete removal of the contaminants was obtained in 20 minutes of treatment.

EXAMPLE 9

[0125] For the washing of brass buckles contaminated by polishing pastes, di-normal butyl carbonate (DnBC) was used with a purity of over 99% w. The buckles (several tens) were placed in baskets which were immersed in a tank containing about 40 liters of liquid and were kept there in a static position.

[0126] Ultra-sounds were applied to the liquid, thermostat-regulated at 40°C, with an overall power of 800 Watts.

[0127] The complete removal of the contaminants was obtained in 10 minutes of treatment.

EXAMPLE 10 (comparative with 1)

[0128] The washing of metal test-samples carried out according to the procedure described in example 1, was effected using a conventional solvent (carbon-naphtha) consisting of aromatic hydrocarbons. The complete removal of the contaminants from the metal surface of the test-samples was obtained in 15 minutes.

EXAMPLE 11 (comparative with 4)

[0129] The washing of metal test-samples carried out according to the procedure described in example 4, was effected using a conventional solvent (carbon-naphtha) consisting of aromatic hydrocarbons. The complete removal of the contaminants from the metal surface of the test-samples was obtained in 5 minutes.

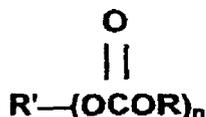
EXAMPLE 12 (comparative with 6)

[0130] The washing of metal test-samples carried out according to the procedure described in example 6, was effected using a conventional solvent consisting of aromatic hydrocarbons and terpene derivatives. The complete removal of the contaminants from the metal surface of the test-samples was obtained in 2 minutes.

Claims

Claims for the following Contracting State(s): CH, LI, CY, ES, GR, LU, MC, PT, SE

1. Use of organic carbonates having formula (I)



wherein:

$$n = 1-4$$

R and R' are two linear or branched alkyl radicals which contain a number of carbon atoms whose sum is equal to at least 5 and which can be the same or different, as solvents for the washing of metal surfaces.

2. The use according to claim 1, wherein the organic carbonates are selected from the group consisting of methyl n-butyl carbonate, methyl n-pentyl carbonate, methyl iso-octyl carbonate, di-isopropyl carbonate, di-n-propyl carbonate, di-n-butyl carbonate, di-iso-octyl carbonate or their mixtures.
3. The use according to claims 1 or 2, wherein the organic carbonates are used in the washing of casings in offshore drilling activities.
4. The use according to claim 1, wherein corrosion inhibitors, non-ionic wetting agents and water are added to the organic carbonates, which are applied as formulates in aqueous emulsion.
5. The use according to claim 4, wherein the weight fraction of each of the additives does not exceed 20% w of the formulate.
6. A process for the washing of metal surfaces which consists in applying the solvent based on organic carbonates according to claim 1 onto metal surfaces,

either manually or by spraying or by immersion in a tank, at atmospheric pressure, at a temperature ranging from 20°C to a maximum which is close to the flash point of the organic carbonate used.

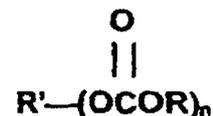
- 5 7. The process according to claim 6, wherein the washing of metal items in a tank is carried out by means of ultra-sounds.
- 10 8. The process according to claim 6, wherein the washing is carried out in an open system and the metal surfaces are contaminated by fluids such as mineral oils, synthetic oils or their emulsions, optionally charged with solids.

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Claims for the following Contracting State(s): AT, BE, DE, DK, FI, FR, GB, IE, IT, NL

- 20 1. Use of organic carbonates having formula (I)

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30 wherein:

$$n = 1-4$$

R and R' are two linear or branched alkyl radicals which contain a number of carbon atoms whose sum is equal to at least 5 and which can be the same or different, as solvents for the washing of metal surfaces, with the proviso that the organic carbonates having formula (I) are not methyl neopentyl carbonate, methyl t-butyl carbonate, methyl sec-butyl carbonate and di-isopropyl carbonate.

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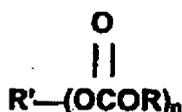
2. The use according to claim 1, wherein the organic carbonates are selected from the group consisting of methyl n-butyl carbonate, methyl n-pentyl carbonate, methyl iso-octyl carbonate, di-n-propyl carbonate, di-n-butyl carbonate, di-iso-octyl carbonate or their mixtures.
3. The use according to claims 1 or 2, wherein the organic carbonates are used in the washing of casings in offshore drilling activities.
4. The use according to claim 1, wherein corrosion inhibitors, non-ionic wetting agents and water are added to the organic carbonates, which are applied as formulates in aqueous emulsion.

5. The use according to claim 4, wherein the weight fraction of each of the additives does not exceed 20% w of the formulate.
6. A process for the washing of metal surfaces which consists in applying the solvent based on organic carbonates according to claim 1 onto metal surfaces, either manually or by spraying or by immersion in a tank, at atmospheric pressure, at a temperature ranging from 20°C to a maximum which is close to the flash point of the organic carbonate used.
7. The process according to claim 6, wherein the washing of metal items in a tank is carried out by means of ultra-sounds.
8. The process according to claim 6, wherein the washing is carried out in an open system and the metal surfaces are contaminated by fluids such as mineral oils, synthetic oils or their emulsions, optionally charged with solids.

Patentansprüche

Patentansprüche für folgende(n) Vertragsstaat(en): CH, LI, CY, ES, GR, LU, MC, PT, SE

1. Verwendung organischer Carbonate der Formel (I)



worin:

n = 1-4

R und R' zwei lineare oder verzweigte Alkylreste sind, die eine Anzahl Kohlenstoffatome enthalten, deren Summe mindestens 5 beträgt, und die gleich oder verschieden voneinander sein können, als Lösemittel zum Waschen von Metalloberflächen.

2. Verwendung gemäß Anspruch 1, worin die organischen Carbonate ausgewählt sind aus der Gruppe bestehend aus Methyl-n-butylcarbonat, Methyl-n-pentylcarbonat, Methyl-iso-octylcarbonat, Di-isopropylcarbonat, Di-n-propylcarbonat, Di-n-butylcarbonat, Di-iso-octylcarbonat oder deren Mischungen.
3. Verwendung gemäß Anspruch 1 oder 2, worin die organischen Carbonate beim Waschen von Casings bei Hochsee-Bohraktivitäten eingesetzt werden.

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4. Verwendung gemäß Anspruch 1, worin Korrosionsinhibitoren, nicht-ionische Netzmittel und Wasser zu den organischen Carbonaten zugegeben werden, die als Formulierungen in wässriger Emulsion aufgetragen werden.

5. Verwendung gemäß Anspruch 4, worin der Gewichtsanteil jedes der Additive 20 Gew.-% der Formulierung nicht übersteigt.

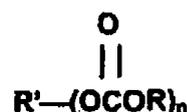
6. Verfahren zum Waschen von Metalloberflächen, bestehend aus dem Auftragen des Lösemittels auf der Basis der organischen Carbonate gemäß Anspruch 1 auf Metalloberflächen, entweder manuell oder durch Sprühen oder durch Eintauchen in einen Tank, bei atmosphärischem Druck, bei einer Temperatur im Bereich von 20°C bis zu einem Maximum nahe dem Flammpunkt des verwendeten organischen Carbonats.

7. Verfahren gemäß Anspruch 6, wobei das Waschen von Metallgegenständen in einem Tank mittels Ultraschall durchgeführt wird.

8. Verfahren gemäß Anspruch 6, wobei das Waschen in einem offenen System durchgeführt wird und die Metalloberfläche mit Flüssigkeiten wie mineralischen Ölen, synthetischen Ölen oder deren Emulsionen, gegebenenfalls mit Feststoffen beladen, unreinigt sind.

Patentansprüche für folgende(n) Vertragsstaat(en): AT, BE, DE, DK, FI, FR, GB, IE, IT, NL

1. Verwendung organischer Carbonate der Formel (I)



worin:

n = 1-4

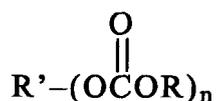
R und R' zwei lineare oder verzweigte Alkylreste sind, die eine Anzahl Kohlenstoffatome enthalten, deren Summe mindestens 5 beträgt, und die gleich oder verschieden voneinander sein können, als Lösemittel zum Waschen von Metalloberflächen, mit der Maßgabe, dass es sich bei den organischen Carbonaten der Formel (I) nicht um Methyl-neopentylcarbonat, Methyl-t-butylcarbonat, Methyl-sec-butylcarbonat und Di-isopropylcarbonat handelt.

2. Verwendung gemäß Anspruch 1, worin die organischen Carbonate ausgewählt sind aus der Gruppe bestehend aus Methyl-n-butylcarbonat, Methyl-n-pentylcarbonat, Methyl-iso-octylcarbonat, Di-n-propylcarbonat, Di-n-butylcarbonat, Di-iso-octylcarbonat oder deren Mischungen.
3. Verwendung gemäß Anspruch 1 oder 2, worin die organischen Carbonate beim Waschen von Casings bei Hochsee-Bohraktivitäten eingesetzt werden.
4. Verwendung gemäß Anspruch 1, worin Korrosionsinhibitoren, nicht-ionische Netzmittel und Wasser zu den organischen Carbonaten zugegeben werden, die als formulierungen in wässriger Emulsion aufgetragen werden.
5. Verwendung gemäß Anspruch 4, worin der Gewichtsanteil jedes der Additive 20 Gew.-% der Formulierung nicht übersteigt.
6. Verfahren zum Waschen von Metalloberflächen, bestehend aus dem Auftragen des Lösemittels auf der Basis der organischen Carbonate gemäß Anspruch 1 auf Metalloberflächen, entweder manuell oder durch Sprühen oder durch Eintauchen in einen Tank, bei atmosphärischem Druck, bei einer Temperatur im Bereich von 20°C bis zu einem Maximum nahe dem Flammpunkt des verwendeten organischen Carbonats.
7. Verfahren gemäß Anspruch 6, wobei das Waschen von Metallgegenständen in einem Tank mittels Ultraschall durchgeführt wird.
8. Verfahren gemäß Anspruch 6, wobei das Waschen in einem offenen System durchgeführt wird und die Metalloberfläche mit Flüssigkeiten wie mineralischen Ölen, synthetischen Ölen oder deren Emulsionen, gegebenenfalls mit Feststoffen beladen, unreinigt sind.

Revendications

Revendications pour l'(les) Etat(s) contractant(s) suivant(s): CH, LI, CY, ES, GR, LU, MC, PT, SE

1. Emploi de carbonates organiques de formule (I) :



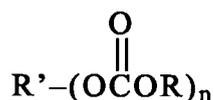
dans laquelle

n vaut de 1 à 4, et R et R' représentent chacun un groupe alkyle linéaire ou ramifié, ces deux groupes, qui peuvent être identiques ou différents, comportant des atomes de carbone en des nombres dont la somme est au moins égale à 5, en tant que solvants pour le lavage de surfaces métalliques.

2. Emploi conforme à la revendication 1, pour lequel les carbonates organiques sont choisis dans l'ensemble formé par le carbonate de méthyle et de n-butyle, le carbonate de méthyle et de n-pentyle, le carbonate de méthyle et d'iso-octyle, le carbonate de di-iso-propyle, le carbonate de di-n-propyle, le carbonate de di-n-butyle et le carbonate de di-iso-octyle, ainsi que leurs mélanges.
3. Emploi conforme à la revendication 1 ou 2, les carbonates organiques étant employés pour le lavage de tubages dans des opérations de forage en mer.
4. Emploi conforme à la revendication 1, pour lequel on ajoute des inhibiteurs de corrosion, des agents mouillants non-ioniques et de l'eau aux carbonates organiques, qui sont mis en oeuvre sous forme de formulations en émulsion aqueuse.
5. Emploi conforme à la revendication 4, pour lequel le poids de chacun des ajouvants ne représente pas plus de 20 % du poids de la formulation.
6. Procédé de lavage de surfaces métalliques, qui consiste à appliquer sur des surfaces métalliques un solvant à base de carbonates organiques, défini dans la revendication 1, en opérant soit à la main, soit par pulvérisation ou par immersion dans une cuve, sous la pression atmosphérique et à une température située dans l'intervalle allant de 20 °C jusqu'à une température maximale voisine du point d'éclair des carbonates organiques employés.
7. Procédé conforme à la revendication 6, dans lequel on effectue le lavage d'articles métalliques dans une cuve à l'aide d'ultra-sons.
8. Procédé conforme à la revendication 6, dans lequel on effectue le lavage en système ouvert et les surfaces métalliques sont souillées par des fluides tels que des huiles minérales, des huiles synthétiques ou des émulsions de telles huiles, éventuellement chargés de solides.

Revendications pour l'(les) Etat(s) contractant(s) suivant(s): AT, BE, DE, DK, FI, FR, GB, IE, IT, NL

1. Emploi de carbonates organiques de formule (I) :



dans laquelle
n vaut de 1 à 4,

et R et R' représentent chacun un groupe alkyle linéaire ou ramifié, ces deux groupes, qui peuvent être identiques ou différents, comportant des atomes de carbone en des nombres dont la somme est au moins égale à 5,

en tant que solvants pour le lavage de surfaces métalliques,

sous réserve que soient exclus de l'ensemble des carbonates organiques de formule (I) le carbonate de méthyle et de néo-pentyle, le carbonate de méthyle et de tert-butyle, le carbonate de méthyle et de sec-butyle et le carbonate de di-iso-propyle.

2. Emploi conforme à la revendication 1, pour lequel les carbonates organiques sont choisis dans l'ensemble formé par le carbonate de méthyle et de n-butyle, le carbonate de méthyle et de n-pentyle, le carbonate de méthyle et d'iso-octyle, le carbonate de di-n-propyle, le carbonate de di-n-butyle et le carbonate de di-iso-octyle, ainsi que leurs mélanges.

3. Emploi conforme à la revendication 1 ou 2, les carbonates organiques étant employés pour le lavage de tubages dans des opérations de forage en mer.

4. Emploi conforme à la revendication 1, pour lequel on ajoute des inhibiteurs de corrosion, des agents mouillants non-ioniques et de l'eau aux carbonates organiques, qui sont mis en oeuvre sous forme de formulations en émulsion aqueuse.

5. Emploi conforme à la revendication 4, pour lequel le poids de chacun des ajouvants ne représente pas plus de 20 % du poids de la formulation.

6. Procédé de lavage de surfaces métalliques, qui consiste à appliquer sur des surfaces métalliques un solvant à base de carbonates organiques, défini dans la revendication 1, en opérant soit à la main, soit par pulvérisation ou par immersion dans une cuve, sous la pression atmosphérique et à une température située dans l'intervalle allant de 20 °C jusqu'à une température maximale voisine du point d'éclair des carbonates organiques employés.

7. Procédé conforme à la revendication 6, dans lequel on effectue le lavage d'articles métalliques dans une cuve à l'aide d'ultra-sons.

8. Procédé conforme à la revendication 6, dans lequel on effectue le lavage en système ouvert et les sur-

faces métalliques sont souillées par des fluides tels que des huiles minérales, des huiles synthétiques ou des émulsions de telles huiles, éventuellement chargés de solides.

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