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(54) **USE OF CLEANING FORMULATION AND PROCESS FOR CLEANING BOTTLES**

VERWENDUNG VON REINIGUNGSMITTELN UND VERFAHREN ZUR FLASCHENREINIGUNG

UTILISATION DES FORMULATIONS DE NETTOYAGE ET PROCEDE DE NETTOYAGE DE
BOUTEILLES

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EP 1 021 507 B1

Description

[0001] The present invention concerns the use of a cleaning formulation comprising an additive, and a process for cleaning bottles, in particular returnable PET bottles, using such.

[0002] Large quantities of beverages including carbonated soft drinks such as Cola's are sold in returnable bottles made of either glass or plastic, particularly PET (PolyEthylene Terephthalate). These bottles must be thoroughly cleaned and disinfected before being refilled to ensure product quality is not adversely affected.

[0003] One of the main problems with beverage bottles after they have been emptied is that moulds can grow in residual product and produce characteristic mould pads. These are difficult to remove by the main component used in bottle washing detergents (caustic soda) unless additional components, namely chelating agents are also present. The preferred chelating agent from the point of view of mould pad removal is EDTA. However, there is considerable pressure from environmental groups and some governments to reduce or preferably eliminate the use of EDTA. An additional drawback of EDTA is that it makes bottle washing solutions more prone to foam. This can adversely affect the performance of the cleaning process unless an antifoam is added. Not only is such an addition costly, it increases the pollution capability of the detergent solution and where plastic bottles are concerned, it can increase chemical damage of the bottles due to stress cracking.

[0004] Instead of EDTA, an alternative chelating agent is sodium gluconate. This has the advantages of being readily biodegradable and not increasing the foaming tendency of cleaning solutions. However, it is a weaker chelating agent and does not remove mould pads as effectively as EDTA, especially at relatively low caustic levels as required for low chemical damage when washing plastic bottles.

[0005] An object of the present invention is to yield an effective detergent additive not having the environmental drawbacks ensuing from the use of EDTA.

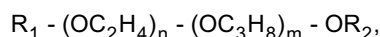
[0006] EP-A-325909 describes alkaline bottle cleaning compositions comprising end blocked ethoxylated nonionic surfactants. Builder and complexing agents may be present.

[0007] According to a first aspect of the invention, there is provided the use of an alkaline washing formulation including an additive for a bottle washing formulation according to claim 1 and dependent claims 2-12.

[0008] This additive, which is free of EDTA or similar chelating agents, is used with an alkaline washing formulation, most preferably a caustic soda based washing formulation, at a concentration of between 0.25 and 3%, preferably 1-2%, whereby in the case of PET bottles the concentration most preferably does not exceed 1.5% in order to minimize stress cracking. This formulation is effective at achieving detergency, particularly against mould pads.

[0009] Sodium gluconate offers the advantages of being commercially available and readily soluble in both alkaline and acidic solutions, thus making the development of concentrated additives possible. Furthermore sodium gluconate will chelate both divalent and trivalent ions. As a result, in addition to facilitating the removal of mould pads, it will remove rust stains from the tops of crown capped bottles and prevent sodium aluminate precipitates forming when washing bottles which carry aluminium foil labels. Another consequence of its trivalent ion chelation capability is that clays extracted from old labels in the wash bath will be dispersed and not precipitate on the bottles being washed.

[0010] A wetting agent is an agent for reducing surface tension in order to increase the intimacy between the cleaning formulation and the soil. According to the present invention the wetting agent has the following general formula:



wherein

R_1 = alkyl chain of length between C_8 and C_{20} (preferably C_{10} to C_{15})

R_2 = H, alkyl (C_1 to C_5) or benzyl

n = 1-20 (preferably 2 to 10)

m = 0 - 15 (preferably below 5 for biogradability)

and is preferably present as a component of a non-ionic blend, which is a blend further comprising an antifoaming agent and a rinsing agent, in order to optimize cleaning. A preferred wetting agent is Plurafac™ LF 131.

[0011] Polyacrylates offer the advantages of being substantially inert, whereby environmental problems associated herewith are limited, being easily precipitated out of waste water, for example, with sewage. Due to their ready solubility they can be used at very concentrated levels, thereby increasing the effectiveness of the detergent additive.

[0012] Further preferred features of the additive according to the present invention are found in the accompanying claims.

[0013] The additive according to the present invention was primarily developed for use in cleaning formulations in soft water areas. When desired for use in hard water areas, a scale forming preventing agent, a phosphonate such as

Dequest 2000™ or Bayhibit AM™, is preferably added.

[0014] The additive can be formulated to be alkaline, acidic or pH-neutral, in the latter case preferably including a preservative, for example formaldehyde, to prevent micro-organisms feeding off the additive and causing this to deteriorate.

[0015] According to a second aspect of the present invention there is provided a process for cleaning bottles, in particular returnable PET beverage bottles.

[0016] This cleaning process is carried out below a maximum temperature of 60°C, above which thermal damage to PET bottles is possible, and between 50°C and 80°C for glass bottles.

[0017] The invention will now be described by way of the following examples.

[0018] A number of new PET bottles were soiled with tomato juice which had been inoculated with the mould *Aspergillus niger*. The soil was allowed to remain in the bottles for 6 weeks after which the moulds had grown into visible colonies which were strongly attached to the PET surface. Cleaning tests were carried out in laboratory scale bottle washer at 60°C which is the maximum safe temperature for washing PET bottles. The detergent solutions were sprayed as a pencil jet onto the inside base of an upturned bottle at a flow rate of 4 l/min. The time for all visible soil to be removed was noted. For each detergent, 3 bottles were cleaned. The table below gives the total time for the 3 bottles to be cleaned.

[0019] Three reference solutions are included:

a) 1% caustic soda

b) 1% caustic soda plus 0.5% base adjunct (20% sodium gluconate + 1.2% nonionic blend)

c) 1% caustic soda plus 0.3% SU 860, wherein SU 860 is a commercially produced adjunct based on EDTA (between 30% and 35% as EDTA Na₄), and additionally comprising sodium gluconate (<10%) and nonionic wetting and antifoaming agents (<3%).

[0020] The remaining test solutions consisted of solution b) plus 500 mg/l of the test additive.

TABLE

No.	Test Solution	Total cleaning time for 3 bottles (min)
1	a) 1% caustic soda	>22
2	b) 1% caustic soda + 0.5% base adjunct	14
3	c) 1% caustic soda + 0.3% SU 860	10
4	b) + Sokalan™ PA 50 (Polyacrylate, M.W. 30,000 ex BASF)	12
5	b) + Sokalan™ PA 25 PN (Polyacrylate, M.W. 4000 ex BASF)	11
6	b) + Versicol E7 (Polyacrylate, M.W. 26,000 ex Allied Colloids)	9
7	b) + Norasol™ LMW 45 (Polyacrylate, M.W. 4500 ex Norso-Haars)	9
8	b) + extra nonionic (180 mg/l)	8
Numbers 4-7 fall within the claimed range.		

[0021] The tests were carried out at caustic soda levels of less than 1.5%, which is the limit for safe washing of PET bottles. Stress cracking tests showed that the effect of the product on stressed PET was less than that of the currently recommended EDTA based product.

[0022] On the basis of the above results, a formulation 9 was developed which consisted of:

Material	%
Sodium gluconate	20.0
Norasol™ LMW 45	11.0
Sodium Cumene Sulphonate (40%)	15.0
Nonionic blend	4.8
Sodium hydroxide (50%)	2.0
water to	100.0

[0023] Cleaning tests showed that 1% caustic soda + 0.2% formulation 9 cleaned 3 bottles which had been aged for 12 weeks in an aggregate time of 10 minutes while 1% caustic soda + 0.3% SU 860 required 12 minutes and 1% caustic soda + 0.3% of a known gluconate based adjunct (Stabilon Flüssig ex Henkel) required 16 minutes.

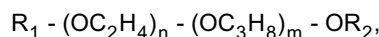
[0024] Although formulation 9 was developed for cleaning PET bottles, it would be equally suitable for cleaning glass

bottles. In this case, it would not be subject to the temperature and caustic level limitations imposed on PET bottle washing.

Claims

1. Use of an alkaline washing formulation, including an additive comprising:

- a polyacrylate,
- sodium gluconate
- and a wetting agent of the general formula



wherein

R_1 = an alkyl chain of length between C_8 and C_{20} ,

R_2 = H, alkyl (C_1 to C_5) or benzyl,

n = 1-20, and m = 0 - 15.

for washing bottles.

2. Use according to claim 1, wherein sodium gluconate is present in the additive within a range of 0.1-40% of the formulation.

3. Use according to claim 1 or 2, wherein the additive comprises a wetting agent of the general formula shown in claim 1, wherein:

R_1 is C_{10} to C_{15} , n = 2-10, and m = 0 - 5

4. Use according to any of the previous claims, wherein the wetting agent is Plurafac™ LF 131.

5. Additive according to any of the previous claims, wherein the wetting agent is present in a non-ionic blend.

6. Use according to any of the previous claims, wherein the polyacrylate has a molecular weight of between 3500 to 30000.

7. Use according to claim 6, wherein the polyacrylate is present in a range of between 0.1 to 20% of the formulation.

8. Use according to claim 7, wherein the polyacrylate belongs to the group consisting of, Sokalan™ PA 25 PN, Versicol™ E7, and Morasol™ LMW 45.

9. Use according to any of claim 1-8, wherein the alkali is caustic soda.

10. Use according to claim 9, wherein caustic soda is present in the formulation in a range of between 0.25 and 3%.

11. Use according to claim 5, wherein the formulation further comprises a solubilizing agent for solubilizing the non-ionic blend.

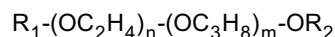
12. Use according to claim 11, wherein the solubilizing agent is sodium cumene sulphonate.

13. Process for washing bottles, comprising the step of exposing bottles to a cleaning formulation according to any of the claims 1-12, at a temperature of 60°C or below for PET bottles and between 50°C and 80°C for glass bottles.

Patentansprüche

1. Verwendung einer alkalischen Waschzubereitung, in die ein Additiv einbezogen ist, welches aufweist:

- ein Polyacrylat,
- Natriumgluconat und
- ein Benetzungsmittel der allgemeinen Formel:



worin sind:

R_1 eine Alkylkette einer Länge zwischen C_8 und C_{20} ,

R_2 H, Alkyl (C_1 bis C_5) oder Benzyl,

n 1 bis 20 und m Null bis 15.

zum Waschen von Flaschen.

2. Verwendung nach Anspruch 1, worin Natriumgluconat in dem Additiv im Bereich von 0,1 bis 40% der Zubereitung vorliegt.

3. Verwendung nach Anspruch 1 oder 2, worin das Additiv ein Benetzungsmittel der allgemeinen Formel nach Anspruch 1 aufweist und worin sind:

R_1 C_{10} bis C_{15} ,

n 2 bis 10 und m Null bis 5.

4. Verwendung nach einem der vorgenannten Ansprüche, worin das Benetzungsmittel Plurafac™ LF 131 ist.

5. Additiv nach einem der vorgenannten Ansprüche, worin das Benetzungsmittel in einem nichtionischen Gemisch vorliegt.

6. Verwendung nach einem der vorgenannten Ansprüche, worin das Polyacrylat eine relative Molekülmasse zwischen 3.500 und 30.000 hat.

7. Verwendung nach Anspruch 6, worin das Polyacrylat im Bereich zwischen 0,1 und 20% der Zubereitung vorliegt.

8. Verwendung nach Anspruch 7, worin das Polyacrylat zu der Gruppe gehört, bestehend aus Sokalan™ PA 25 PN, Versicol™ E7 und Norasol™ LMW 45.

9. Verwendung nach einem der Ansprüche 1 bis 8, worin das Alkali Ätznatron ist.

10. Verwendung nach Anspruch 9, worin das Ätznatron in der Zubereitung im Bereich zwischen 0,25 und 3% vorliegt.

11. Verwendung nach Anspruch 5, worin die Zubereitung ferner ein solubilisierendes Mittel zum Solubilisieren des nichtionischen Gemisches aufweist.

12. Verwendung nach Anspruch 11, worin das solubilisierende Mittel Natriumcumensulfonat ist.

13. Verfahren zum Waschen von Flaschen, umfassend den Schritt der Exponierung der Flaschen an einer Zubereitung zum Reinigen nach einem der Ansprüche 1 bis 12 bei einer Temperatur von 60°C oder darunter für PET-Flaschen und zwischen 50° und 80°C für Glasflaschen.

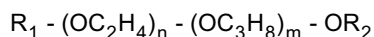
Revendications

1. Utilisation d'une formule de lavage alcaline comprenant un additif comprenant :

- un polyacrylate

EP 1 021 507 B1

- un gluconate de sodium
- et un agent mouillant de la formule générale



dans laquelle R_1 = une chaîne alkyle d'une longueur comprise entre C_8 et C_{20} ,

R_2 = H, alkyle (C_1 à C_3) ou benzyle

n = 1 à 20, et m = 0 à 15, pour le lavage de bouteilles.

- Utilisation selon la revendication 1, dans laquelle le gluconate de sodium est présent dans l'additif en proportion variant de 0,1 à 40 % de la formule.
- Utilisation selon la revendication 1 ou 2, dans laquelle l'additif comprend un agent mouillant de la formule générale indiquée dans la revendication.
 R_1 va de C_{10} à C_{15} , n = 2 à 10 et m = 0 à 5.
- Utilisation selon l'une quelconque des revendications précédentes, dans laquelle l'agent mouillant est du Plura-fac™ LP 131.
- Additif selon l'une quelconque des revendications précédentes dans lequel l'agent mouillant est présent dans un mélange non-ionique.
- Utilisation selon l'une quelconque des revendications précédentes, dans laquelle le polyacrylate a une masse moléculaire comprise entre 3 500 et 30 000.
- Utilisation selon la revendication 6, dans laquelle le polyacrylate est présent en proportion variant de 0,1 à 20 % de la formule.
- Utilisation selon la revendication 7, dans laquelle le polyacrylate appartient au groupe comprenant le Sokalan™ PA 25 PN, le Versicol™ E7, et le Norasol™ LMW 45.
- Utilisation selon l'une quelconque des revendications 1 à 8, dans laquelle l'alcali est de la soude caustique.
- Utilisation selon la revendication 9, dans laquelle la soude caustique est présente dans la formule en proportion variant de 0,25 à 3 %.
- Utilisation selon la revendication 5, dans laquelle la formule comprend en outre un agent de désagrégation pour solubiliser le mélange non-ionique.
- Utilisation selon la revendication 11, dans laquelle l'agent de désagrégation est du sulfonate de cumène de sodium.
- Procédé pour le lavage de bouteilles comprenant l'étape consistant à soumettre les bouteilles à une formule de nettoyage selon l'une quelconque des revendications 1 à 12, à une température de 60 °C ou inférieure pour les bouteilles en PET et une température comprise entre 50 °C et 80 °C pour les bouteilles en verre.