

DRAIN TREATMENT COMPOSITION

FIELD OF THE INVENTION

- 5 The present invention relates to a drain treatment composition. In particular, the present invention relates to a single-part drain treatment composition for use in cleaning and/or unblocking of waste water outlet pipes, such as those in kitchens of residential property.

10 BACKGROUND TO THE INVENTION

- The accumulation of deposits such as food and fatty material in the waste water outlet pipes and outlet traps of kitchen sinks can slow the rate in which water drains from the basin of the sink. These deposits can build up over time and
15 solidify in the outlet trap and impede or block the drainage of water.

- Various chemical treatments have been developed for cleaning waste water outlet pipes. Products intended for domestic use are usually designed to be poured into the drain of the sink and left to work for a length of time before the waste pipes are
20 flushed. A variety of acid-based and alkali-based products are available, in liquid and solid forms. Some products (typically liquid products) are two-part, in which two compositions are mixed at the point of use to create an exothermic reaction and/or foaming. Other products are single-part and may exhibit exothermic behaviour upon mixing with water in the drain. An exothermic reaction at the site of
25 the blockage is useful in increasing the rate of the breakdown of the blockage.

- Commonly, alkali-based drain cleaning products use highly concentrated sodium hydroxide, which causes the fatty deposits to be saponified into water-soluble derivatives which can then more easily be flushed through the system.

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Aluminium is often added to sodium hydroxide-based drain cleaners to enhance the heat generated by virtue of hydrogen gas production.

- Although effective in cleaning drains and removing blockages, highly concentrated sodium hydroxide is corrosive towards many pipe materials as well as human tissues. Sodium hydroxide is also known to be an irritant to the respiratory tract. It
- 5 is therefore imperative that the appropriate safety measures are used when handling such a drain treatment product. Further, if sodium hydroxide is not fully dissolved in the drain, it may harden and further worsen the initial blockage. Both sodium hydroxide and aluminium also contribute to pollution of water systems.
- 10 Enzymatic treatment compositions are an alternative to acid and alkali-based compositions, however they suffer from stability limitations and thus have a reduced shelf-life.

- Against that background, it would be desirable to provide an improved drain
- 15 treatment composition that offers, for example, improved performance, improved safety, and/or adequate shelf life.

SUMMARY OF THE INVENTION

- 20 Aspects of the invention are specified in the independent claims. Preferred features are specified in the dependent claims.

- The disclosure relates to a single-part drain treatment composition that comprises an alkali metal percarbonate and sodium sulfite. Preferably, the composition
- 25 includes at least 30 wt% of an alkali metal percarbonate, more preferably from 30 wt% to 70 wt% of an alkali metal percarbonate.

- In a first aspect, a single-part drain treatment composition in the form of a divided solid is provided. The treatment composition comprises at least 30 wt% of an alkali
- 30 metal percarbonate and at least 30 wt% of sodium sulfite.

When such a composition is dispensed into a drain and mixes with standing water

within the drain, an exothermic reaction is produced and heat is generated. The heat generated catalyses and/or speeds up the breakdown of blockages, particularly those formed from fatty deposits.

- 5 The compounds used in the composition offer improved safety in the context of a domestic product, compared to prior art products containing compounds such as sodium hydroxide and aluminium.

10 The alkali metal percarbonate may be sodium percarbonate. Sodium percarbonate is an oxidising agent which, when dissolved in water, yields hydrogen peroxide.

In some cases, it may be desirable to limit the amount of alkali metal percarbonate in the composition, for example for regulatory reasons or for compliance with shipping restrictions.

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To that end, the composition may comprise an alkali metal persulfate. In such cases, the composition may comprise up to 20 wt% of the alkali metal persulfate. In such cases, the alkali metal percarbonate and the alkali metal persulfate may together comprise from 30 wt% to 70 wt% of the composition.

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In embodiments which comprise an alkali metal persulfate, it has been found that a lower amount of alkali metal percarbonate may be used, such as 35 wt%, without substantial loss of efficacy or reduced rate of reaction.

- 25 The composition may comprise at least 1 wt%, or at least 10 wt%, of the alkali metal persulfate.

The alkali metal persulfate, when present, acts as an additional oxidising agent.

Preferably, the alkali metal persulfate is potassium monopersulfate, available

- 30 commercially as caroat (registered trade mark of United Initiators GmbH) or oxone (registered trade mark of DuPont).

The composition may comprise up to 40 wt% of the alkali metal percarbonate. In such cases, where an alkali metal persulfate is additionally provided, the alkali metal persulfate and the alkali metal percarbonate together are sufficient to react with the sodium sulfite.

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The composition may comprise equal amounts by weight of alkali metal percarbonate and sodium sulfite, particularly when an alkali metal persulfate is present.

10 In some embodiments, a relatively large amount of alkali metal percarbonate may be used, particularly where no alkali metal persulfate is present or only a small amount of alkali metal persulfate is provided (for example 5 wt% or less). For example, the composition may comprise at least 50 wt% or at least 60 wt% of the alkali metal percarbonate.

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The alkali metal percarbonate may be provided as coated particles. The use of coated particles of the alkali metal percarbonate improves the stability and therefore shelf life of the composition by decreasing its rate of degradation into hydrogen peroxide. Such coated particles of alkali metal percarbonates are widely
20 commercially available.

The composition may comprise up to 1 wt% sodium metabisulfite. Sodium metabisulfite has been found to maintain the elevated temperature provided by the exothermic reaction for a longer duration.

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Preferably, each component of the composition is in the form of a divided solid. Examples of divided solids include granules, powders, pellets, and mixtures thereof. Preferably, each component of the composition is in a granular form. Having the composition in a granular form improves the stability of the formulation
30 whilst limiting the levels of respiratory exposure to the formulation, compared to a powder.

The composition may further comprise amorphous silica as a drying agent, and the composition is preferably anhydrous. Since the alkali metal percarbonate reacts with water to form hydrogen peroxide, using a drying agent and/or ensuring that the composition is anhydrous reduces the rate of degradation of the alkali metal percarbonate.

The composition may further comprise a bulking agent. The bulking agent is preferably sodium sulfate. The bulking agent may comprise up to 15 wt% of the composition.

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The composition may further comprise a bleach activator, such as tetraacetythylenediamine. The composition may comprise, for example, up to 1 wt% tetraacetythylenediamine.

15 The composition may further comprise a surfactant. The surfactant may be sodium dodecylbenzene sulfonate. A surfactant can solubilise or emulsify fats which can promote the breakdown of a fatty blockage.

The composition may further comprise a fragrance additive and/or a dyestuff. Any suitable fragrance or dyestuff may be used, in any suitable quantity. The fragrance additive and/or the dyestuff may for example comprise from 0.01 wt% to 0.5 wt% of the composition. The dyestuff may preferably comprise from 0.01 wt% to 0.05 wt% of the composition. In some examples, red pomegranate is used as the fragrance additive.

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In some embodiments, the composition is substantially non-foaming and/or may exclude foam promoting agents.

The composition of the first aspect is particularly suitable for use in cleaning and/or unblocking domestic kitchen drains. However, the composition is not limited to such uses, and could be used for cleaning and/or unblocking drains and waste water pipework in other situations, such as in commercial or industrial applications.

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The composition of the first aspect may comprise from 30 wt% to 40 wt% of sodium percarbonate, from 30 wt% to 40 wt% of sodium sulfite, and from 15 wt% to 20 wt% of a compound selected from the group consisting of potassium
5 monopersulfate, sodium monopersulfate, potassium persulfate, sodium persulfate, and mixtures thereof.

In a second aspect, the invention resides in a method of treating a drain containing standing water. The method comprises dispensing the composition of the first
10 aspect into the drain such that the composition mixes with the standing water.

Preferably, after dispensing the composition into the drain, the composition is allowed to dwell, for example for at least 5 minutes. Subsequently, the drain may be flushed with water. The drain may be flushed with cold water (e.g. at less than
15 15°C or less than 20°C), but more preferably warm or hot water is used (e.g. at higher than 40°C or 50°C).

A third aspect of the invention resides in use of the composition of the first aspect for cleaning and/or unblocking drains.
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The invention further extends, in a fourth aspect, to a single-use drain treatment product. The product comprises between 30 grams and 200 grams of the composition of the first aspect, contained in a container. It has been found that such a quantity of the composition is sufficient to treat drain blockages, in
25 particular kitchen drain blockages, so that the whole contents of the container can be poured into a drain as a single-use drain treatment.

Preferred and/or optional features of each aspect and embodiment of the invention may also be used, alone or in appropriate combination, in the other aspects and
30 embodiments also.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The proportion of components in the compositions described herein are expressed as "wt%", equivalent to "weight percent", "wt%" or "weight%", throughout the
5 description unless otherwise defined. Each term refers equivalently to the relative weight of the respective component based on the overall weight of the formulation.

The present invention provides a drain treatment composition which is a safer and more stable alternative to many conventional drain treatment products and which
10 does not require the use of highly corrosive sodium hydroxide or other problematic compounds. The relative proportions of components, and in particular the relative proportions of the specified oxidising agents and reducing agents, provide a composition which works effectively to clean drains and clear blockages typical of kitchen drains.

15 Advantageously, the composition is in a single-part form, which removes the need for mixing multiple parts of a treatment composition prior to use. This has both safety and convenience benefits. The composition is in the form of a divided solid, to provide rapid dissolution of the components and thereby to increase the
20 reaction rate, whilst maintaining stability of the composition.

The sodium percarbonate is preferably in a commercially available coated particle form, where the coating for example may comprise a mixture of sodium carbonate, sodium sulfate and sodium metasilicate. Other possible coatings may include
25 disilicate-based layers or carbonic acid, for example. When present, the coating should be water soluble.

It has been found that a total mass dosage of the single-part treatment composition of from 30 grams to 200 grams demonstrates efficacy against
30 common causes of blockages in a kitchen drain, for example the accumulation of fatty deposits in a sink drain trap.

- In some embodiments, the composition comprises from 30 wt% to 35 wt%, from 30 wt% to 40 wt%, from 30 wt% to 45 wt%, from 30 wt% to 50 wt%, from 30 wt% to 55 wt%, from 30 wt% to 60 wt%, from 30 wt% to 65 wt%, or from 30 wt% to 70 wt% of the alkali metal percarbonate. The alkali metal percarbonate functions as an oxidising agent. Any suitable alkali metal percarbonate may be selected. Preferably, the alkali metal percarbonate is sodium percarbonate. In other examples, the alkali metal percarbonate may be potassium percarbonate, or a mixture of sodium percarbonate and potassium percarbonate.
- 10 In some embodiments, the composition comprises from 0 wt% to 5 wt%, from 0 wt% to 10 wt%, from 0 wt% to 15 wt%, or from 0 wt% to 20 wt% of the alkali metal persulfate, as an oxidising agent. An alkali metal persulfate refers to both an alkali metal monopersulfate, such as potassium monopersulfate, or an alkali metal peroxydisulfate, such as sodium persulfate. Any suitable alkali metal persulfate
- 15 may be used. For example, the alkali metal persulfate may be potassium monopersulfate, sodium monopersulfate, potassium persulfate, or sodium persulfate, or a mixture thereof. Potassium monopersulfate is commercially available as oxone (registered trade mark) or carcoat (registered trade mark), referring to a triple salt with the formula $2\text{KHSO}_5 \cdot \text{KHSO}_4 \cdot \text{K}_2\text{SO}_4$. In some
- 20 embodiments, the composition does not comprise an alkali metal persulfate.

In some embodiments, the composition may comprise at least 50 wt%, or at least 60 wt% of alkali metal percarbonate without an alkali metal persulfate. In some embodiments, the composition may comprise at least 30 wt%, up to 35 wt%, or up to 40 wt% of an alkali metal percarbonate with at least 10 wt%, or at least 15 wt% of an alkali metal persulfate.

In some embodiments, the composition comprises from 30 wt% to 35 wt%, or from 30 wt% to 40 wt% of sodium sulfite, as a reducing agent.

An exothermic reaction occurs between the oxidising agent(s) and reducing agent(s) when exposed to the standing water within a drain. In this way, the

components remain stable and unreactive whilst in the form of a divided solid and the desired heat-generating effect only occurs once the composition has been dispensed into a water-containing drain. It has been found that the reaction results in an elevated temperature of from about 65 to 90 degrees Celsius which is

5 sustained for a sufficient length of time to clean and/or unblock the drain in which the composition is used.

The stability of the disclosed compositions has been validated and a shelf life of over two years has been demonstrated.

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In some embodiments, the composition comprises from 0 wt% to 0.5 wt%, or from 0 wt% to 1 wt% of sodium metabisulfite. In some embodiments, the composition does not comprise sodium metabisulfite.

15 In the disclosed examples, sodium dodecylbenzene sulfonate is used as a surfactant. In other embodiments, other suitable surfactants may be used, such as anionic and/or amphoteric surfactants familiar to a person skilled in the art. In some embodiments, the composition does not comprise a surfactant.

20 Tetraacetythylenediamine (TAED) reacts with hydrogen peroxide to form peracetic acid, a bleach activator. TAED has been found to catalyse the rate of reaction and thus reduce the required time for the drain treatment composition to work. In some embodiments, the composition does not comprise TAED.

25 In some embodiments, amorphous silica is used as a drying agent. It is preferred that the water content of the composition is minimised to limit the premature reaction or degradation of the components. In some embodiments, alternative commonly used desiccants may be used. In some embodiments, the composition may not comprise a drying agent.

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Examples

In the following examples 1 to 12, working embodiments of the present invention are disclosed. To produce the composition of each example, coated granular sodium percarbonate (obtained from Resource Chemical Ltd, Brackley, UK) was added to a clean, dry vessel. The remaining components in the granular form were sequentially added to the vessel and mixed to form a homogenous granular mixture. The order upon which the components are added to the vessel does not impact the physical or chemical properties of the resulting composition.

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All of the examples were tested with a simulated kitchen drain blockage and were able to effectively clear the blockage without adverse effects (such as excessive heating or a violent reaction). It was also observed that the disclosed examples did not exhibit clumping when exposed to water during the testing. Clumping would be disadvantageous since clumping could cause additional drain blockages and reduce efficacy.

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Examples 1 to 3 describe compositions in which 35 wt% of sodium percarbonate was used in combination with from 15 wt% to 18 wt% potassium monopersulfate.

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Example 1

Sodium percarbonate	35 wt%
Sodium sulfite	35 wt%
Sodium sulfate	11.70 wt%
Potassium monopersulfate	18 wt%
Red pomegranate fragrance	0.20 wt%
Amorphous silica	0.10 wt%

Example 2

Sodium percarbonate	35 wt%
Sodium sulfite	35 wt%
Sodium sulfate	11.20 wt%
Sodium metabisulfite	0.5 wt%
Potassium monopersulfate	18 wt%
Red pomegranate fragrance	0.20 wt%
Amorphous silica	0.10 wt%

Example 3

Sodium percarbonate	35 wt%
Sodium sulfite	35 wt%
Sodium sulfate	13.70 wt%
Tetraacetylenediamine	1 wt%
Potassium monopersulfate	15 wt%
Red pomegranate fragrance	0.20 wt%
Amorphous silica	0.10 wt%

- 5 Examples 4 to 12 describe compositions in which no alkali metal persulfate was present. In these cases, a higher amount (from 50 wt% to 65 wt%) of sodium percarbonate was used to maintain a suitable reaction rate and temperature increase, comparable to the potassium monopersulfate-containing compositions of examples 1 to 3.

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Example 4

Sodium percarbonate	50 wt%
Sodium sulfite	40 wt%
Sodium sulfate	10 wt%

Example 5

Sodium percarbonate	60 wt%
Sodium sulfite	40 wt%

Example 6

Sodium percarbonate	65 wt%
Sodium sulfite	35 wt%

5 *Example 7*

Sodium percarbonate	59.5 wt%
Sodium sulfite	40 wt%
Sodium dodecylbenzene sulfonate	0.5 wt%

Example 8

Sodium percarbonate	59.8 wt%
Sodium sulfite	40 wt%
Sodium dodecylbenzene sulfonate	0.2 wt%

Example 9

Sodium percarbonate	63.8 wt%
Sodium sulfite	35 wt%
Tetraacetylenediamine	1 wt%
Sodium dodecylbenzene sulfonate	0.2 wt%

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Example 10

Sodium percarbonate	64.8 wt%
Sodium sulfite	35 wt%
Sodium dodecylbenzene sulfonate	0.2 wt%

Example 11

Sodium percarbonate	64.6 wt%
Sodium sulfite	35 wt%
Sodium dodecylbenzene sulfonate	0.2 wt%
Red pomegranate fragrance	0.2 wt%

Example 12

Sodium percarbonate	63.5 wt%
Sodium sulfite	35 wt%
Sodium dodecylbenzene sulfonate	0.2 wt%
Red pomegranate fragrance	0.2 wt%
Tetraacetylenediamine	1 wt%
Amorphous silica	0.1 wt%

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Further modifications and variations not explicitly described above can also be contemplated without departing from the scope of the invention as defined in the appended claims.

CLAIMS

1. A single-part drain treatment composition comprising a mixture of divided solid components, the components comprising:
5 from 30 wt% to 70 wt% of an alkali metal percarbonate; and
 at least 30 wt% of sodium sulfite.
2. The composition of claim 1, wherein the alkali metal percarbonate is sodium percarbonate.
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3. The composition of claim 1 or claim 2, wherein the composition further comprises up to 20 wt% of an alkali metal persulfate, and wherein the alkali metal percarbonate and the alkali metal persulfate together comprise from 30 wt% to 70 wt% of the composition.
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4. The composition of claim 3, wherein the composition comprises at least 10 wt% of the alkali metal persulfate.
5. The composition of claim 3 or claim 4, wherein the alkali metal persulfate is
20 potassium monopersulfate.
6. The composition of any preceding claim, comprising up to 40 wt% of the alkali metal percarbonate.
- 25 7. The composition of any preceding claim, wherein the composition comprises equal amounts by weight of the alkali metal percarbonate and sodium sulfite.
8. The composition of claim 1 or claim 2, comprising at least 50 wt% of the
30 alkali metal percarbonate.
9. The composition of any preceding claim, wherein the alkali metal

percarbonate is provided as coated particles.

10. The composition of any preceding claim, wherein the composition further comprises up to 1 wt% sodium metabisulfite.
- 5 11. The composition of any preceding claim, wherein each component of the composition is in a granular form.
12. The composition of any preceding claim, further comprising a drying agent.
- 10 13. The composition of claim 12, wherein the drying agent comprises amorphous silica.
14. The composition of any preceding claim, further comprising a bulking agent.
- 15 15. The composition of claim 14, wherein the bulking agent comprises sodium sulfate.
16. The composition of claim 14 or claim 15, wherein the bulking agent
- 20 comprises up to 15 wt% of the composition.
17. The composition of any preceding claim, further comprising tetraacetythylenediamine.
- 25 18. The composition of claim 17, wherein the composition comprises up to 1 wt% tetraacetythylenediamine.
19. The composition of any preceding claim, further comprising a surfactant.
- 30 20. The composition of claim 19, wherein the surfactant comprises sodium dodecylbenzene sulfonate.

21. The composition of any preceding claim, wherein the composition further comprises a fragrance additive.
22. The composition of claim 1, comprising:
- 5 from 30 wt% to 40 wt% of sodium percarbonate;
 from 30 wt% to 40 wt% of sodium sulfite; and
 from 15 wt% to 20 wt% of a compound selected from the group
 consisting of potassium monopersulfate, sodium monopersulfate,
 potassium persulfate, sodium persulfate, and mixtures thereof.
- 10
23. A method of treating a drain containing standing water, the method comprising dispensing the composition of any preceding claim into the drain such that the composition mixes with the standing water.
- 15
24. Use of the composition according to any of claims 1 to 22 for cleaning and/or unblocking drains.
25. A single-use drain treatment product, comprising from 30 grams to 200 grams of the composition of claims 1 to 22, contained in a container.
- 20