

DESCRIPTION

TITLE OF THE INVENTION

UROLITH REMOVAL AND PREVENTION AGENT

Technical Field

[0001]

The present invention relates to an agent for removing and preventing urolith, consisting of at least two layers that are the first layer comprising solid carboxylic acid as the main component and the second layer comprising sulfamic acid as the main component. The agent for removing and preventing urolith of the present invention may be applied to men's toilet that flushes or that has no flushing facility. The present application claims priority of Japanese Patent Application No. 2018-018439 filed on February 5, 2018, the contents of which are incorporated herein.

Background Art

[0002]

In toilet waste pipes, particularly in men's toilet waste pipes, scale called urolith is formed, which is a firmly adhered mixture of a calcium-based compound and organic substances that are produced by the degradation of urine, disturbing the flow of urine and flushing water, and causing clogging of the waste pipe in extreme cases to place the toilet in an unusable state. Additionally, organic substances in urolith become rotten by bacteria to generate a bad odor.

[0003]

Conventionally, as a method for removing scale that has firmly adhered to a toilet bowl and a toilet waste pipe, a method has been performed in which cleaning is done with agents.

As scale removal agents, many products comprising a liquid-form acid as the main component have been used, while products comprising sulfamic acid as the main component have also been used. Sulfamic acid is advantageous since it is readily soluble in water, does not form poorly soluble salts with calcium, and is a relatively strong acid with less worry of corroding metal products. Sulfamic acid, however, gradually hydrolyzes in aqueous solutions and therefore, liquid-form products thereof have a problem of storage stability and as a result, most products are used as powder-form agents or solid agents.

In particular, cleaning with sulfamic acid takes time and effort and is difficult to carry out on usual toilet. Thus, a method has been attracting attention, in which a solid agent is placed inside the trap of a toilet bowl or a waste pipe such that sulfamic acid is automatically eluted with flowing water or the like to remove urolith. Nevertheless, there is a problem about solid agents that, while the inclusion of other components than sulfamic acid is advantageous for solidification in terms of production and storage, some of such components may render sulfamic acid less prone to elute at a sufficient concentration to remove urolith. Therefore, various considerations have been made with regard to the formulation of solid agents.

For example, Patent Document 1 describes a scale remover which is molded from sulfamic acid powder and sucrose fatty acid ester powder whose particle size has been adjusted. This agent has an effect of not disintegrating in water and is suitable for use inside the trap of a urinal. [0004]

Further and separately, as a method for preventing scale which intends to prevent new deposition of scale, a method has been performed in which an agent is injected into a part of the flushing water pipe, or in which a solid agent is placed in the toilet bowl of a men's toilet, or the like.

For example, Patent Document 2 exemplifies sulfamic acid as a solid acid that may be included in solid anti-scaling agents.

However, sulfamic acid has a rapid dissolution rate in water, which shortens the duration of its effect when used as an anti-scaling agent, and therefore is generally not suitable as an anti-scaling agent. As main components of anti-scaling agents, organic acids having not too a high solubility in water as represented by benzoic acid, fumaric acid and the like, are often used. Meanwhile, in some cases, agents whose main effect is to prevent scale are sold under the name of scale remover which requires caution in use.

Patent Document 3 describes a solid detergent containing sulfamic acid and oxycarboxylic acid as essential components. This, however, is a scale remover and is not suggested for use as an anti-scaling agent.

Prior Art Documents

Patent Documents

[0005]

Patent Document 1: Japanese Unexamined Patent Application
Publication No. 7-26300

Patent Document 2: Japanese Unexamined Patent Application
Publication No. 8-206688

Patent Document 3: Japanese Unexamined Patent Application
Publication No. 2000-63890

Summary of the Invention

Object to be Solved by the Invention

[0006]

The object of the present invention is to use a solid agent which is intended to remove and prevent urolith in toilet or toilet waste pipes to exert both effects of removing and preventing urolith without requiring troublesome maintenance such as cleaning, by simply placing the agent in a toilet bowl.

Means to Solve the Object

[0007]

The present inventors made a keen study to solve the above object and as a result, have found that both fast-acting removal of urolith and subsequent lasting prevention of firm adhesion of urolith may be performed by placing in a toilet bowl a solid agent for removing and preventing urolith, consisting of at least two layers that are the upper layer comprising solid carboxylic acid as the main component and the lower layer comprising sulfamic acid as the main component, and thus completed the present invention.

[0008]

Specifically, the present invention relates to:

(1) a solid agent for removing and preventing urolith for toilet, consisting of at least two layers that are a first layer containing 60 to 99.9% by mass of solid carboxylic acid and a second layer that is below the first layer when in use, containing 60 to 100% by mass of sulfamic acid;

(2) the agent for removing and preventing urolith for toilet according to (1), wherein, in use, at least part of the first layer remains at a time point when the second layer has completely disintegrated or dissolved;

(3) a set of agent for removing and preventing urolith for toilet, comprising the agent for removing and preventing urolith for toilet according to (1) or (2), wherein the agent is stored in a container having a shape that does not unintentionally turn upside down and having a through-hole at least on an upper part and a lower part;

(4) a set of agent for removing and preventing urolith for toilet, comprising at least two solid agents that are a first agent containing 60 to 99.9% by mass of solid carboxylic acid and a second agent containing 60 to 100% by mass of sulfamic acid, wherein it is indicated directly or indirectly that the first agent is above the second agent at the time of starting to use;

(5) the set of agent for removing and preventing urolith for toilet according to (4), further comprising a container for storing the first agent and the second agent, wherein the container has a shape that does not unintentionally turn upside down and has a through-hole at least on an upper part and a lower part;

(6) a set of agent for removing and preventing urolith for toilet, comprising at least two solid agents that are a first agent containing 60 to 99.9% by mass of solid carboxylic acid and a second agent containing 60 to 100% by mass of sulfamic acid, wherein the solid agents are stored in a container having a shape that does not unintentionally turn upside down and having a through-hole at least on an upper part and a lower part, such that the solid agents are in a state in which the first agent is above the second agent at the time of starting to use; and

(7) a method of using the agent for removing and preventing urolith for toilet according to (1) or (2), or using at least a first agent containing 60 to 99.9% by mass of solid carboxylic acid and a second agent containing 60 to 100% by mass of sulfamic acid that are made into a set such that they are in a state in which the first agent is above the second agent at the time of starting to use, the method comprising storing the agent or the set in a container having a shape that does not unintentionally turn upside down and having a through-hole at least on an upper part and a lower part, and using the agent or the set in a toilet bowl.

Effect of the Invention

[0009]

The agent for removing and preventing urolith for toilet of the present invention can remove urolith inside waste pipes and in addition, prevent firm adhesion of urolith for a long period thereafter, by simply placing the agent in the toilet bowl.

Mode of Carrying Out the Invention

[0010]

(1) Agent for removing and preventing urolith for toilet, consisting of at least two layers

The agent for removing and preventing urolith for toilet of the present invention is a solid agent, consisting of at least two layers that are the first layer containing 60 to 99.9% by mass of solid carboxylic acid and a second layer that is below the first layer when in use, containing 60 to 100% by mass of sulfamic acid.

By using the agent for removing and preventing urolith for toilet of the present invention in a state where the second layer is below the first layer at least at the time of starting to use, both fast-acting removal of urolith and subsequent prevention of firm adhesion of urolith may be performed.

[0011]

The first layer contains 60 to 99.9% by mass of solid carboxylic acid. The content of the solid carboxylic acid in the first layer is preferably 75 to 99.5% by mass.

Solid carboxylic acid refers to carboxylic acids that are solid at ordinary temperature and are exemplified by succinic acid, citric acid, maleic acid, isophthalic acid, tartaric acid, hydroxyacetic acid, fumaric acid, adipic acid, salicylic acid, placidylic acid, hydrocinnamic acid, benzoic acid and the like. These solid carboxylic acids may be used alone or used as a mixture of two or more thereof.

As components of the first layer, additives such as excipient, binder, lubricant, dissolution rate regulator,

surfactant, coloring agent such as pigment, perfume, corrosion inhibitor, fungicide and chelating agent (sequestrant) are used apart from solid carboxylic acid which is the main component.

In use, the first layer is preferably the top layer, while a different top layer may be present above the first layer, which could prevent damage and moisture absorption during storage. This top layer preferably disintegrates or dissolves more easily in water than the first layer. For example, it is possible to provide a top layer which consists of the same component composition as that of a bottom layer described in the next section that is different from the second layer. Further, it is also possible to cover the whole agent comprising the first layer and the second layer with a layer having the above component composition, to serve as both the top layer and the bottom layer.

[0012]

The second layer contains 60 to 100% by mass of sulfamic acid. The content of sulfamic acid in the second layer is preferably 80% by mass or more. The sulfamic acid preferably disintegrates or dissolves early in the presence of water, and it is rather unpreferable to have an effect of being less prone to disintegrate in water as described in Patent Document 1.

As components of the second layer, additives such as excipient, binder, lubricant, dissolution rate regulator, surfactant, coloring agent such as pigment, perfume, corrosion inhibitor, fungicide and chelating agent are used apart from sulfamic acid which is the main component.

Further, the second layer may be formed of sulfamic acid alone, without using these components.

When in use, the second layer is preferably the bottom layer, while this is not essential and a different bottom layer may be present under the second layer. Such a bottom layer could prevent damage and moisture absorption during storage. This bottom layer, however, needs to disintegrate or dissolve more easily in water than the second layer to expose the second layer. Additionally, for example, it is possible to provide a bottom layer which consists of the same component composition as the above-mentioned different top layer. Further, it is also possible to cover the whole agent comprising the first layer and the second layer with a layer having the above component composition, to serve as both the top layer and the bottom layer.

[0013]

Between the first layer and the second layer, single or plural intermediate layers that are different from the first layer and the second layer may be provided for the purpose of facilitating production or enhancing storage stability. A preferred intermediate layer does not disintegrate or dissolve more easily in water than the second layer in order to retain the shape of the agent of the present invention until the time point at which the second layer has completely disintegrated or dissolved.

[0014]

Use of an agent in which the first layer and the second layer both contain similar amounts of sulfamic acid and solid carboxylic acid results in an early disintegration of the whole agent, providing a urolith removal effect while

losing the subsequent urolith prevention effect, or vice versa, becoming less soluble to lose the urolith removal effect, and consequently, a urolith removal effect and a urolith prevention effect cannot be exerted together.

When the second layer is below the first layer, the second layer is in an environment constantly providing easy contact with water even when water is not being filled, which facilitates the disintegration of the second layer to obtain a reliable urolith removal effect. When the first layer and the second layer are upside down, this does not necessarily mean the loss of the urolith removal effect, while it is difficult to obtain a reliable urolith removal effect, since sulfamic acid becomes less prone to dissolve and in addition, even if the second layer has disintegrated, it does not always directly flow into the waste pipes.

As stated above, the object of the agent for removing and preventing urolith for toilet is, firstly, to rapidly exert a urolith removal effect and then exert a urolith prevention effect for a long period thereafter. Therefore, in use, at least part of the first layer preferably remains and more preferably, 90% by volume of the first layer remains at the time point when the second layer has completely disintegrated or dissolved.

To exert the above effects, the whole first layer needs to be above the second layer at least at the time of starting to use.

[0015]

(Method of production)

The method of production of the agent for removing and preventing urolith for toilet of the present invention is

not particularly limited, which is exemplified by tablet molding, melt molding and the like, while methods using tablet molding is easier and preferred, since the present invention is a solid agent having different compositions depending on the position.

Specifically, tablet molding includes:

- i) a method of filling a tableting mortar with raw material powder for the second layer and on top of it, filling the mortar with raw material powder for the first layer and then compressing the all layers at the same time to make a tablet;
- ii) a method of filling a tableting mortar with raw material powder for the second layer, followed by compression and then on top of it, filling the mortar with raw material powder for the first layer, followed by compression to make a tablet (a method of tableting layer-wise), and the like.

In case of using an intermediate layer between the first layer and the second layer, using a further separate layer under the second layer, or using a further separate layer on the first layer, such use may also be done according to the above i) or ii).

[0016]

(Method of use and measures for the use)

The agent for removing and preventing urolith for toilet of the present invention needs to be used in a state in which the first layer is above the second layer to exhibit the effect of the present invention. Accordingly, it is necessary that the agent is prevented from unintentionally becoming upside down. The phrase "unintentionally becoming upside down" specifically means, for example, a case where a user at the time of placing the agent places the agent

upside down by mistake or a case where the agent becomes upside down during use due to the impact of the water flow, or the like.

Means of preventing the agent from unintentionally becoming upside down is not particularly limited as long as the effect of the present invention is not inhibited.

In order to prevent placing of the agent upside down by mistake, it is preferred that the upper and lower of the agent are easily identifiable. For this purpose, there is, for example, a method of coloring the first layer and the second layer with different colors to facilitate an easy identification of the upper and lower by referring to the package, instructions and the like of the agent.

In order to prevent the agent from becoming upside down during use, there is, for example, a method of making the agent into a flat shape.

[0017]

Further, it is preferred to store the agent for removing and preventing urolith of the present invention in a container having a shape that does not unintentionally turn upside down, in order to supply the agent in a state where it can directly be placed in a toilet bowl. Specifically, for example, the container may be made into a flat shape or a shape that engages with a structure in the toilet bowl such as the drain outlet, and the agent may also be made into a shape that does not unintentionally turn upside down inside the container. Further, a person who places the agent may be prevented from placing the agent upside down without realizing, by a method such as applying an aesthetic design on the upper side of the container or

making the container particularly protruding on the upper side so that the container cannot be stably placed upside down.

When using such a container, the container needs to have a single or plural through-holes at least on the upper part and the lower part so that water is poured from the upside to the agent. The through-holes on the upper part may also serve as the above-mentioned aesthetic design.

[0018]

The shape of the agent for removing and preventing urolith for toilet of the present invention is not particularly limited as long as the agent is able to exhibit the above effects. In particular, the shape seen from the upside may be any shape, taking into account other effects than those described above on solubility and the like and design, as long as it does not cause any difficulties in production or storage. For example, the container may be in a shape of circle, oval, triangle, rectangle and the like and may also be in a doughnut-form provided with a through-hole in the vertical direction, and further, may also be provided with a concavity and convexity on the surface such as by providing a concavity or a protrusion on the center part.

[0019]

(2) Set of agent for removing and preventing urolith for toilet

The set of agent for removing and preventing urolith for toilet of the present invention has any of the following embodiments.

[0020]

(Set consisting of an agent for removing and preventing urolith for toilet and a container thereof)

This embodiment represents a set comprising the agent for removing and preventing urolith for toilet of the present invention stored in the container described in the above section of "Method of use and measures for the use".
[0021]

(Set consisting of an agent for removing urolith for toilet and an agent for preventing urolith for toilet)

The same effect as that of the agent for removing and preventing urolith for toilet of the present invention may be exhibited not only by the single solid agent described above, but also, at least by using at least two solid agents that are the first agent which is an agent for preventing urolith for toilet, having the same composition as the above-described first layer and the second agent which is an agent for removing urolith for toilet, having the same composition as the above-described second layer, in a state in which the first agent is above the second agent at the time of starting to use. Therefore, a set comprising at least the above first agent and the second agent and having at least any of the following features (1) and (2) belongs to the technical scope of the present invention.

(1) It is directly or indirectly indicated as its method of use that the first agent is above the second agent at the time of starting to use.

(2) At least two solid agents that are the first agent and the second agent are stored in a container having a shape that does not unintentionally turn upside down and having a through-hole at least on the upper part and the lower part,

to produce a state in which the first agent is above the second agent at the time of starting to use.

The shapes of the first agent and the second agent are both similarly exemplified by the shapes described above as "the shape of the agent for removing and preventing urolith for toilet of the present invention". Additionally, the both agents preferably have flat shapes such that the first agent does not slide down before the second agent disintegrates or dissolves and preferably have similar shapes and cross-sectional areas when seen from the upside. In use, at least part of the first layer preferably remains and more preferably, 90% by volume of the first layer remains at the time point when the second layer has completely disintegrated or dissolved.

Meanwhile, if needed, the first agent and the second agent may be placed in a state where single or plural solid agents, that are different from the first agent and the second agent, are held in-between them. It is preferred that these separate solid agents completely disintegrate or dissolve before the first agent does, and does not let the first agent slide down even after the separate solid agents have disintegrated or dissolved such that they do not affect the functions of the first agent and the second agent.

[0022]

The method of indicating the above feature (1) is not particularly limited, which includes the methods as follows.

- Method of direct indication: a method of indication where a method of use is indicated in the set, which enables a person to place the set who has recognized information from characters, figures and the like described in the

indication to immediately learn the method of use. More specifically, there are a method in which the method of use is indicated on the packaging material containing the first agent and the second agent and a method in which a document indicating the method of use is enclosed with the first agent and the second agent.

- Method of indirect indication: a method where the indication of the same embodiment as any of the above indicates that a separate indication should be referred to and the separate indication directly indicates the method of use. Examples of the separate indication include instructions that are distributed to a person to place the set, a distributed or posted advertisement, a web-page accessible by the general public, designated customer or the like. Alternatively, the examples include, in case where a container described below is not included in the set and it is directly indicated that such a container is necessary to use the set, an indication of method of use provided on such a container/packaging material of such a container/or an enclosure with such a container, and the like. Further, the indication of method of use stated above does not have to simply indicate the method of use alone which may be indicated together with the specifications, components, explanations on precautions and the like with regard to the present set.

[0023]

(Set consisting of an agent for removing urolith for toilet, an agent for preventing urolith for toilet and a container thereof)

This embodiment represents a set including a container in addition to the above feature (1). The set further comprises the container described in the section of "Method of use and measures for the use" in addition to the above-described "set consisting of an agent for removing urolith for toilet and an agent for preventing urolith for toilet", wherein the above-described indication further indicates directly or indirectly that the first agent and the second agent are so stored in the container that they are in a state in which the first agent is above the second agent at the time of starting to use. This container needs to have a shape that does not unintentionally turn upside down and to have a through-hole at least on the upper part and the lower part. Further, in addition to that, the container preferably has a shape and/or an inner diameter that can prevent the first agent from sliding down before the second agent disintegrates or dissolves. For example, the container may be made to have an inner diameter that is slightly larger than the diameters of the first agent and the second agent. The specific embodiment of the indication is the same as that described above.

[0024]

(Set comprising an agent for removing and preventing urolith for toilet stored in a container)

This embodiment represents a set having the above feature (2). This embodiment enables to supply the set in a state that it can be directly placed in the toilet bowl. Thus, the indication to the effect that "the first agent is above the second agent at the time of starting to use" is not essential, while if necessary, the method of use such

as how to place the container may be indicated directly or indirectly.

Example

[0025]

Hereinbelow, the present invention will be described in more detail with reference to Examples. However, the scope of the present invention is not intended to be limited in any way to the Example described below.

[0026]

The following raw material powders were used as raw materials for respective layers. The term "parts" represents parts by mass.

(Raw material powder for the first layer)

Benzoic acid (flakes)	99.0 parts
Calcium stearate	0.5 parts
Corrosion inhibitor	0.5 parts
Pigment (Cromophtal blue)	0.0015 parts

The above components were mixed to provide the raw material powder.

(Raw material powder for the second layer)

Sulfamic acid	100 parts
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[0027]

A 47 mm-diameter circular mortar was filled with 50 g of raw material powder for the second layer. Then the filling surface was made level and on top of the surface, 20 g of raw material powder for the first layer was filled. A pressure of 100 kg-weight was applied to the filling by the pestle of a hand press machine. The pressure was kept

for 10 seconds and then the pestle was withdrawn to take out the tablet.

The obtained tablet was 47 mm in diameter and about 25 mm (the first layer was about 10 mm and the second layer was about 15 mm) in thickness. Only the first layer was colored to make the upper and lower of the tablet easily identifiable. Further, no crack or chip was found on the appearance and no sticking to the pestle or the mortar occurred.

[0028]

(Test example)

One tablet obtained above was placed on the trap cover of a urinal. Then, the urinal was flushed with about 1 L of water (about 20°C) per push. After the flush(es), about 70 mL of water was collected from inside the trap of the urinal (the total amount of water was about 235 mL) to measure the pH, and the operation described so far was repeated. Further, marble stones that had been weighed in advance (mock urolith, which weighed about 0.04 to 0.08 g before the test) were sunken at room temperature for three hours in respective corrected water after the measurement of pHs. Then the marble stones were washed with tap water for one minute, dried in a dryer oven at 50°C for 15 hours and weighed. The amount of dissolution was calculated from the difference in weight of the marble stone before and after the test. Meanwhile, a dissolution test method that uses marble stones has conventionally been employed, since urolith has as its main ingredient hard calcium carbonate in common with marble stones. Such a test method is described, for example, in Japanese Unexamined Patent

Application Publication (Translation of PCT Application) No. 2001-518969.

The pHs and the amounts of dissolution of marble stones in the above test were as follows. The appearance of the tablet was observed and it was found that the lower layer still remained after 13 times of push, while the lower layer almost disappeared after 15 times of push.

[0029]

[Table 1]

Number of push	pH	Amount of dissolution of marble stone (g)
At the start of use	8.47	—
1	2.33	0.0011
3	1.37	0.0166
8	1.35	0.0112
10	1.38	0.0319
12	1.25	0.0390
13	1.33	0.0208
14	1.64	0.0041
15	4.65	0.0003

[0030]

The above results have demonstrated that the tablet of the Example of the present invention exerts a urolith removal effect by particularly lowering pH up to 14 times of push and even after that, has an effect of lowering pH to the extent to exert a urolith prevention effect. From these results, it is readily inferred that, even if the first layer and the second layer are separate tablets (the first agent and the second agent, respectively), the same effect is provided as long as the first agent and the second agent are placed to assume the same upper and lower relationship described.

CLAIMS

1. A solid agent for removing and preventing urolith for toilet, consisting of at least two layers that are a first layer containing 60 to 99.9% by mass of solid carboxylic acid and a second layer that is below the first layer when in use, containing 60 to 100% by mass of sulfamic acid.

2. The agent for removing and preventing urolith for toilet according to claim 1, wherein, in use, at least part of the first layer remains at a time point when the second layer has completely disintegrated or dissolved.

3. A set of agent for removing and preventing urolith for toilet, comprising the agent for removing and preventing urolith for toilet according to claim 1 or 2, wherein the agent is stored in a container having a shape that does not unintentionally turn upside down and having a through-hole at least on an upper part and a lower part.

4. A set of agent for removing and preventing urolith for toilet, comprising at least two solid agents that are a first agent containing 60 to 99.9% by mass of solid carboxylic acid and a second agent containing 60 to 100% by mass of sulfamic acid, wherein it is indicated directly or indirectly that the first agent is above the second agent at the time of starting to use.

5. The set of agent for removing and preventing urolith for toilet according to claim 4, further comprising a container

for storing the first agent and the second agent, wherein the container has a shape that does not unintentionally turn upside down and has a through-hole at least on an upper part and a lower part.

6. A set of agent for removing and preventing urolith for toilet, comprising at least two solid agents that are a first agent containing 60 to 99.9% by mass of solid carboxylic acid and a second agent containing 60 to 100% by mass of sulfamic acid, wherein the solid agents are stored in a container having a shape that does not unintentionally turn upside down and having a through-hole at least on an upper part and a lower part, such that the solid agents are in a state in which the first agent is above the second agent at the time of starting to use.

7. A method of using the agent for removing and preventing urolith for toilet according to claim 1 or 2, or using at least a first agent containing 60 to 99.9% by mass of solid carboxylic acid and a second agent containing 60 to 100% by mass of sulfamic acid that are made into a set such that they are in a state in which the first agent is above the second agent at the time of starting to use, the method comprising storing the agent or the set in a container having a shape that does not unintentionally turn upside down and having a through-hole at least on an upper part and a lower part, and using the agent or the set in a toilet bowl.