DESCRIPTION

Title of Invention

METHOD FOR TREATING ACIDIC EXHAUST GAS, EQUIPMENT FOR TREATING ACIDIC EXHAUST GAS, AND INCINERATION FACILITY

Technical Field

[0001] The present invention relates to a method for treating an acid exhaust gas generated from an incinerator, an equipment for treating an acid exhaust gas, and an incineration facility.

Background Art

[0002] Combustion exhaust gases discharged from incinerators in combustion facilities contain acid gases being hazardous acid substances, such as hydrogen chloride, sulfur oxides (SO_x) such as sulfur dioxide, and nitrogen oxides (NO_x) such as nitrogen monoxide and nitrogen dioxide. Hence, prior to release of the combustion exhaust gases into the air, these acid gases need to be removed. Hereinafter, the combustion exhaust gas containing acid gases refers to an acid exhaust gas.

[0003] PTL 1 describes a method for treating an acid exhaust gas in which method acid substances such as hydrogen chloride, SO_x and NO_x are simultaneously treated by bringing the acid exhaust gas generated in a combustion facility into contact with a solid acid exhaust gas treatment agent containing a layered double hydroxide.

Citation List

Patent Literature

[0004] PTL 1: JP 2016-190199 A

Summary ~~of Invention~~

Technical Problem

[0005] However, the method for treating an acid exhaust gas described in PTL 1 has the following problem: due to the fact that the layered double hydroxide is less likely to take in nitrogen monoxide as compared with hydrogen chloride and

SO_x, the method cannot exhibit a sufficient treatment performance on nitrogen monoxide accounting for much of NO_x components in the acid exhaust gas.

Then, it is conceivable that, after oxidization of nitrogen monoxide to be converted into nitrogen dioxide by an oxidation catalyst, the exhaust gas may be brought into contact with an acid exhaust gas treatment agent containing the layered double hydroxide as seen in the method for treating an acid exhaust gas described in PTL 1; however, there is such a risk that the oxidation catalyst and components in the acid exhaust gas react to produce reaction products and impair the oxidation catalyst effect of the oxidation catalyst. If the oxidation catalyst effect of the oxidation catalyst is impaired, a problem of deterioration of treatment performance on nitrogen monoxide in the acid exhaust gas may arise.

[0006] In consideration of the above problem, the present ~~invention~~ disclosure has an object to provide: a method for treating an acid exhaust gas, which method has a high treatment capability on acid gases containing nitrogen oxides in the acid exhaust gas; an equipment for treating an acid exhaust gas; and an incineration facility.

Solution to Problem

[0006a] In an aspect of the present disclosure, there is provided a method for treating an acid exhaust gas generated from an incinerator, comprising the following first to third steps:

the first step of bringing the acid exhaust gas generated from the incinerator into contact with an anionic layered double hydroxide to remove sulfur oxides in the acid exhaust gas;

the second step of bringing the acid exhaust gas having undergone the first step into contact with a transition metal oxide to convert nitrogen monoxide in the acid exhaust gas into nitrogen dioxide; and

the third step of removing nitrogen oxides in the acid exhaust gas having undergone the second step,

wherein in the third step, the acid exhaust gas having undergone the second step is brought into contact with an anionic layered double hydroxide to remove nitrogen oxides in the acid exhaust gas.

[0006b] In another aspect of the present disclosure, there is provided an equipment for treating an acid exhaust gas, comprising means for carrying out the method for treating an acid exhaust gas as defined above.

[0006c] In another aspect, there is provided an incineration facility, comprising: an incinerator; and the equipment for treating an acid exhaust gas as defined above.

[0007] As a result of exhaustive studies to solve the above problem, the present inventors have found that the above problem can be solved by removal of SO_x in an acid exhaust gas by a layered double hydroxide, followed by oxidization of nitrogen monoxide to be converted into nitrogen dioxide by a transition metal oxide, leading to completion of the present ~~invention~~disclosure.

That is, the present ~~invention~~ disclosure provides the following [1] to [13].

[1] A method for treating an acid exhaust gas generated from an incinerator, including the following first to third steps:

the first step of bringing the acid exhaust gas generated from the incinerator into contact with an anionic layered double hydroxide to remove sulfur oxides in the acid exhaust gas;

the second step of bringing the acid exhaust gas having undergone the first step into contact with a transition metal oxide to convert nitrogen monoxide in the acid exhaust gas into nitrogen dioxide; and

the third step of removing nitrogen oxides in the acid exhaust gas having undergone the second step.

a third accommodation section that accommodates the anionic layered double hydroxide to be used in the third step; and

respective pipes to introduce the acid exhaust gas generated from the incinerator to the first accommodation section, to introduce the gas discharged from the first accommodation section to the second accommodation section, and to introduce the gas discharged from the second accommodation section to the third accommodation section.

[10] The equipment for treating an acid exhaust gas according to the above [9], wherein the first accommodation section includes:

a first container and a second container that each accommodate the anionic layered double hydroxide, and

a first switching valve to selectively introduce the acid exhaust gas generated from the incinerator to the first container or the second container.

[11] The equipment for treating an acid exhaust gas according to the above [9] or [10], further including a first concentration detection device, arranged on the upstream side of the second accommodation section, to continuously detect the concentration of sulfur oxides in the acid exhaust gas discharged from the first accommodation section.

[12] The equipment for treating an acid exhaust gas according to any one of the above [9] to [11], wherein the third accommodation section includes:

a third container and a fourth container that each accommodate the anionic layered double hydroxide, and further,

a second switching valve to selectively introduce the gas discharged from the second accommodation section to the third container or the fourth container.

[13] An incineration facility, including: an incinerator; and the equipment for treating an acid exhaust gas according to any one of the above [8] to [12].

Advantageous Effects ~~of Invention~~

[0008] According to the present ~~invention~~disclosure, there can be provided a method for treating an acid exhaust gas, which method has a high treatment capability on acid gases containing nitrogen oxides in the acid exhaust gas, an equipment for treating the acid exhaust gas, and an incineration facility.

Brief Description of Drawings

[0009]

CLAIMS

[Claim 1]

A method for treating an acid exhaust gas generated from an incinerator, comprising the following first to third steps:

the first step of bringing the acid exhaust gas generated from the incinerator into contact with an anionic layered double hydroxide to remove sulfur oxides in the acid exhaust gas;

the second step of bringing the acid exhaust gas having undergone the first step into contact with a transition metal oxide to convert nitrogen monoxide in the acid exhaust gas into nitrogen dioxide; and

the third step of removing nitrogen oxides in the acid exhaust gas having undergone the second step,

wherein in the third step, the acid exhaust gas having undergone the second step is brought into contact with an anionic layered double hydroxide to remove nitrogen oxides in the acid exhaust gas.

[Claim 2]

The method for treating an acid exhaust gas according to claim 1, wherein in the third step, nitrogen oxides and hydrogen chloride in the acid exhaust gas having undergone the second step are removed.

[Claim 3]

The method for treating an acid exhaust gas according to claim 1 or 2, wherein the anionic layered double hydroxide is a CO_3-type Mg-Al layered double hydroxide.

[Claim 4]

The method for treating an acid exhaust gas according to any one of claims 1 to 3, wherein the transition metal oxide is a γ-type manganese dioxide.

~~[Claim 5]~~

~~The method for treating an acid exhaust gas according to any one of claims 1 to 4, wherein in the third step, the acid exhaust gas having undergone the second step is brought into contact with an anionic layered double hydroxide to remove nitrogen oxides in the acid exhaust gas.~~

[Claim ~~6~~5]

The method for treating an acid exhaust gas according to any one of claims 1 to ~~5~~4, wherein in the first step, the acid exhaust gas is selectively introduced to any one path among a plurality of paths each containing an anionic layered double hydroxide, and while the acid exhaust gas is brought into contact with the anionic layered double hydroxide contained in the one path, the anionic layered double hydroxides contained in the other paths among the plurality of paths are regenerated.

[Claim ~~7~~6]

The method for treating an acid exhaust gas according to any one of claims 1 to ~~6~~5, wherein in the third step, the acid exhaust gas is selectively introduced to any one path among a plurality of paths each containing an anionic layered double hydroxide, and while the acid exhaust gas is brought into contact with the anionic layered double hydroxide contained in the one path, the anionic layered double hydroxides contained in the other paths among the plurality of paths are regenerated.

[Claim ~~8~~7]

An equipment for treating an acid exhaust gas, comprising means for carrying out the method for treating an acid exhaust gas according to any one of claims 1 to ~~7~~6.

[Claim ~~9~~8]

The equipment for treating an acid exhaust gas according to claim ~~8~~7, comprising:

a first accommodation section that accommodates the anionic layered double hydroxide to be used in the first step;

a second accommodation section that accommodates the transition metal oxide to be used in the second step;

a third accommodation section that accommodates the anionic layered double hydroxide to be used in the third step; and

respective pipes to introduce the acid exhaust gas generated from the incinerator to the first accommodation section, to introduce the gas discharged from the first accommodation section to the second accommodation section, and to introduce the gas discharged from the second accommodation section to the third accommodation section.

[Claim ~~10~~9]

The equipment for treating an acid exhaust gas according to claim ~~9~~8, wherein the first accommodation section comprises:

a first container and a second container that each accommodate the anionic layered double hydroxide, and further,

a first switching valve to selectively introduce the acid exhaust gas generated from the incinerator to the first container or the second container.

[Claim ~~11~~10]

The equipment for treating an acid exhaust gas according to claim ~~9~~ 8 or ~~10~~9, further comprising a first concentration detection device, arranged on the upstream side of the second accommodation section, to continuously detect a concentration of sulfur oxides in the acid exhaust gas discharged from the first accommodation section.

[Claim ~~12~~11]

The equipment for treating an acid exhaust gas according to any one of claims ~~9~~ 8 to ~~11~~10, wherein the third accommodation section comprises:

a third container and a fourth container that each accommodate the anionic layered double hydroxide, and

a second switching valve to selectively introduce the gas discharged from the second accommodation section to the third container or the fourth container.

[Claim ~~13~~12]

An incineration facility, comprising: an incinerator; and the equipment for treating an acid exhaust gas according to any one of claims ~~8~~ 7 to ~~12~~11.