a carbonate-type Mg-Al layered double hydroxide by contacting with a treated gas from which acid gases other than carbon dioxide have been removed by the carbonate-type Mg-Al layered double hydroxide.

Cited List

Patent Literature

[0005]

PTL1: JP 2016-190199 A

PTL2: JP 2021-090913 A

Summary

Technical Problem

[0006]

According to the regeneration method described in PTL1, since it is necessary to mix the used layered double hydroxide with a carbonate aqueous solution, a facility for regenerating the used layered double hydroxide is required to be provided outside a combustion plant. In this case, it is necessary to transport the used layered double hydroxide and the regenerated carbonate-type Mg-Al layered double hydroxide between a combustion plant and the regeneration facility of the layered double hydroxide, and it is also necessary to install the regeneration facility of the layered double hydroxide separately from the combustion plant, so that there is a problem that labor and cost burdens are large.

In the case where a facility for regenerating the used layered double hydroxide is installed in a combustion plant, installation and connection of a storage tank and a mixing tank for the carbonate aqueous solution are required, so that the scale of the combustion plant is required to be enlarged.

[0007]

According to the regeneration method described in PTL2, although installation of a large-scale regeneration facility for a layered double hydroxide is not required in a combustion plant, the problem is that a sufficient regeneration effect is hardly obtained.

[0008]

An object of the present disclosure is to provide a method for regenerating carbonate-type layered double hydroxide, capable of regenerating a used layered double hydroxide obtained after a carbonate-type Mg-Al layered double hydroxide is used for treatment of an acid exhaust gas, into a carbonate-type Mg-Al layered double hydroxide effectively without

requirement of a large-scale facility, a method for treating acid exhaust gas, and a facility for treating acid exhaust gas.

Solution to Problem

[0009]

As a result of extensive studies, the present inventors have found that a used layered double hydroxide can be effectively regenerated into a carbonate-type Mg-Al layered double hydroxide by contacting a used layered double hydroxide obtained after a carbonate-type Mg-Al layered double hydroxide is used in treatment of an acid exhaust gas, with a treated gas containing carbon dioxide treated with the carbonate-type Mg-Al layered double hydroxide in the presence of an alkali. The present disclosure is based on the finding.

[0010]

That is, the present disclosure provides the following [1] to [7].

[1] In an aspect, there is provided a method for regenerating a used carbonate-type Mg-Al layered double hydroxide in which at least some of interlayer carbonate ions of a carbonate-type Mg-Al layered double hydroxide are exchanged with another anion, the method comprising:

contacting the used carbonate-type Mg-Al layered double hydroxide with a carbon dioxide-containing gas that comprises carbon dioxide in the presence of an alkali.

[2] The method for regenerating a used carbonate-type Mg-Al layered double hydroxide according to item [1],

wherein the used carbonate-type Mg-Al layered double hydroxide is obtained by contacting a carbonate-type Mg-Al layered double hydroxide with an acid exhaust gas comprising carbon dioxide and acid materials other than carbon dioxide to remove the acid materials from the acid exhaust gas, thereby obtaining a treated gas, and

the carbon dioxide-containing gas that comprises carbon dioxide is the treated gas.

[0011]

[3] The method for regenerating a used carbonate-type Mg-Al layered double hydroxide according to item [2],

wherein the acid exhaust gas is a combustion exhaust gas generated from an incinerator.

[4] In another aspect, there is provided a method for treating an acid exhaust gas, comprising:

an acid exhaust gas treatment step of contacting an acid exhaust gas comprising carbon dioxide and acid materials other than carbon dioxide with a carbonate-type Mg-Al layered double hydroxide to remove the acid materials from the acid exhaust gas, thereby obtaining a treated gas; and

a regeneration step of regenerating a used carbonate-type Mg-Al layered double hydroxide generated in the acid exhaust gas treatment step,

wherein in the regeneration step, the regeneration method according to item [2] or [3] is performed.

[0012]

[5] In another aspect, there is provided a facility for treating an acid exhaust gas, comprising:

a housing container that houses a carbonate-type Mg-Al layered double hydroxide;

a supply pipe that supplies an acid exhaust gas comprising carbon dioxide and acid materials other than carbon dioxide to the housing container;

a discharge pipe that discharges a treated gas discharged from the housing container after treatment of the acid materials therein; and

a regeneration apparatus that regenerates the carbonate-type Mg-Al layered double hydroxide in the housing container;

wherein the regeneration apparatus comprises an alkali addition apparatus that adds an alkali to the housing container, and a return pipe that returns the treated gas to the housing container.

[6] The facility for treating an acid exhaust gas according to item [5], wherein the alkali addition apparatus comprises an alkaline aqueous solution storage tank that stores an alkaline aqueous solution, and an alkaline aqueous solution inflow pipe that connects the alkaline aqueous solution storage tank and the housing container.

[7] The facility for treating an acid exhaust gas according to item [5] or [6], wherein the regeneration apparatus is connected to the housing container and comprises a waste liquid discharge apparatus to discharge the alkaline aqueous solution flowing into the housing container to the outside of the housing container.

Advantageous Effects

[0013]

According to the present disclosure, there can be provided a method for regenerating a carbonate-type layered double hydroxide, capable of regenerating a used layered double hydroxide obtained after a carbonate-type Mg-Al layered double hydroxide is used for treatment of an acid exhaust gas, into a carbonate-type Mg-Al layered double hydroxide effectively without requirement of a large-scale facility, a method for treating acid exhaust gas, and a facility for treating acid exhaust gas.

Brief Description of Drawings