

Description

The present invention relates to a method of and apparatus for treating waste gas from a semiconductor manufacturing process. More particularly, the present invention pertains to a method which is suitable for treating such a waste gas with a dry solid absorbent. The present invention is also concerned with an apparatus which may be effectively employed to practice this waste gas treatment method.

In the manufacture of semiconductor devices, dry processes such as plasma CVD and plasma etching have been progressively adopted and, as a result, there has been an increasing demand for a method of effectively treating the waste gas discharged from such dry processes. In particular, a waste gas treatment that utilizes a dry process has recently been strongly desired in view of the simplicity and other advantages it could offer, and absorbents for various kinds of gas have been developed and put into practical use.

A detailed examination of the flow rate of gas discharged from the above-described dry process has revealed that the flow rate of gas discharged during the treatment of wafers is substantially equal to the total flow rate of gas used, i.e., about several liters per minute, whereas, when the reaction chamber is evacuated to a level below that of atmospheric pressure, the gas is discharged at a flow rate of several thousands of l/min, which is equivalent to the rated displacement of the evacuating pump used, although this only takes place for a short period of time.

In the case where waste gas discharged from semiconductor manufacturing equipment is directly treated with a dry solid absorbent, it is necessary to employ an absorbent which enables the treatment to be stably and safely carried out independently of such extremely large variations in the gas flow rate. More specifically, it is necessary to employ such as absorbent that, even when waste gas is passed through a packed layer of absorbent at a high flow rate, substantially no rise in the resistance to gas flow occurs, and the gas component which is to be removed can be completely absorbed within the packed layer. However, to maintain the resistance to gas flow at a low level, a coarse absorbent must be used; this involves the problem that, as the particle diameter of the absorbent increases, the surface area which participates in absorption or adsorption becomes relatively low, which leads to a reduced absorbing capacity. Although attempts have been made to increase the absorbing capacity by, for example, using a porous absorbent, there is a limit to the effectiveness of these methods; in actual fact a predetermined absorbing capacity can only be ensured by packing a

considerably large amount of absorbent. Some kinds of waste gas react with the packed absorbent to form solid matter; in such a case, even if a coarse absorbent is used, the packed layer gradually becomes clogged with the reaction product, resulting inevitably in an increased resistance to gas flow.

It is known from JP-A-6 044 025 to provide a dry etching chamber and absorbing towers, with a diffusion pump and a rotary pump connected between the chamber and the towers. An outlet from the absorbing towers exhausts the treated waste gas. The apparatus disclosed enables exhaust gas treatment to occur without clogging the rotary pump, by exhausting gas from a dry etching process using BCl_3 through a perfectly dried rotary pump while absorbing BCl_3 in an adsorbing tower.

In view of the above-described circumstances, it is a primary object of the present invention to provide a method of treating waste gas from semiconductor manufacturing equipment with a dry solid absorbent which enables avoidance of large variations in the flow rate of waste gas and thus permits safe and efficient waste gas treatment with an absorbent having a relatively small particle diameter, and also to provide an apparatus which may be effectively employed to practice this waste gas treatment method.

According to a first aspect of the invention, an apparatus for treating toxic waste gas discharged from a semiconductor manufacturing process, comprises:

a reaction chamber forming part of a semiconductor manufacturing equipment; a container packed with dry solid absorbent;

an inlet pipe providing gas communication between the reaction chamber and the container;

an outlet pipe providing gas communication between the container and the atmosphere;

an evacuation device disposed between the reaction chamber and the inlet pipe, the evacuation device providing gas communication between the reaction chamber and the inlet pipe and adapted to force gas flow from the reaction chamber to the inlet pipe;

a main valve provided between the reaction chamber of the semiconductor manufacturing equipment and the evacuating device;

bypass pipe providing gas communication between the inlet pipe and the outlet pipe;

a bypass valve adapted to open or close the bypass pipe, whereby gas will flow through the container when the bypass valve is closed, and will flow through both the container and the bypass pipe when the bypass valve is open; and

an electric circuit for opening and closing the main valve and bypass valve.

According to a second aspect of the invention, a method of treating waste gas from a semiconductor manufacturing process, by using the apparatus of the first aspect comprises, the following steps:

treating the toxic waste gas from a reaction chamber of semiconductor manufacturing equipment under vacuum with a dry solid absorbent;

introducing under vacuum an inert purge gas at a rate of about 1-30 l/min into the reaction chamber for a short period of time sufficient to render the equipment non-toxic after termination of a reaction and treating the toxic component containing gas with the dry solid absorbent;

introducing under vacuum an inert purge gas at a rate of about 1-30 l/min into the evacuating device for a short period of time sufficient to render the evacuating device, the inlet pipe of the absorbent-packed container and the bypass pipe Non toxic;

bringing the reaction chamber to atmospheric pressure;

venting a large amount of a non-toxic gas from the reaction chamber at an atmospheric pressure of about 760 torr (1.33×10^2 Pa) to about $1-10^{-5}$ torr (1.33×10^{-3} Pa) mainly through the bypass pipe which is equipped with a bypass valve between inlet pipe of the absorbent-packed container and outlet pipe of the absorbent-packed container.

The above and other objects, features and advantages of the present invention will become more apparent from the following description taken in conjunction with the accompanying drawing.

Fig. 1 schematically shows the flow of the waste gas from semiconductor manufacturing equipment to a container packed with a waste gas absorbent.

The present invention will be described hereinafter in detail with reference to the accompanying drawing.

Referring to Fig. 1, which schematically shows the flow of waste gas from semiconductor manufacturing equipment 2 to a container 10 packed with a waste gas absorbent, the semiconductor manufacturing equipment 2 may be of any type, provided that the equipment treats wafers under a high vacuum in a process such as plasma CVD or plasma etching, and therefore the kind and flow rate of process gas 1 may also be selected as desired in accordance with the conditions of each individual process. Further, it is also possible to select as desired the kind and amount of absorbent which is to be packed in the container 10 and the dimensions and configuration of the packed container 10.

Generally speaking, during a wafer treatment, the process gas 1 is fed into a reaction chamber 14 of the semiconductor manufacturing equipment 2 to react with wafers, and the waste gas generated

after the reaction is sent by the operation of an evacuating device 5 to the absorbent-packed container 10 where it is made harmless before being discharged.

When the reaction chamber 14 of the semiconductor manufacturing equipment 2 is evacuated to a predetermined level of pressure (about $1-10^{-5}$ torr/about 1.33×10^{-3} Pa) after the pressure inside the chamber 14 has been returned to atmospheric pressure (about 760 torr/about 1.33×10^2 Pa) in order to allow the replacement of wafers or to conduct maintenance, a bypass valve 7 is opened to release a large amount of the non-toxic gas from the reaction chamber 14 through a bypass pipe 8, thereby preventing the large amount of flowing gas from being passed through the absorbent-packed container 10. Since the large amount of gas is not discharged until a main valve 3 is opened, the bypass valve 7 may be opened in advance on the basis of a signal for opening the main valve 3. However, since the main valve 3 is kept open during the etching process, the bypass valve 7 is also left open unless otherwise arranged. Therefore, the bypass valve 7 is arranged to be closed by the action of a timer after a predetermined period of time has elapsed. It is possible to set the timer to any period of time so long as it is one within which the flow rate of the discharged gas and the inlet pressure of the absorbent-packed container 10 can drop sufficiently and within which no process gas will be fed into the reaction chamber 14.

If a large amount of discharged non-toxic gas is fed directly into the absorbent-packed container 10, the pressure at the inlet of the container 10 rises. Therefore, the arrangement may be such that such a rise in pressure is detected by means of a pressure sensor 9 and the bypass valve 7 is opened in response to a signal output from the pressure sensor 9. In such a case, however, a hunting phenomenon may occur in which, at the same time as the bypass valve 7 is opened, the inlet pressure lowers, and the pressure sensor 9, which detects this lowering in pressure, closes the bypass valve 7, resulting in the pressure rising such as to cause the bypass valve 7 to open again. It is therefore preferable to employ a timer and to set it so that the bypass valve 7 is closed after the evacuation has achieved the desired lowering of the flow rate of the non-toxic gas and so that, even when the bypass valve 7 is closed, the inlet pressure is sufficiently low and there is hence no fear of the bypass valve 7 being undesirably opened again.

Since waste gas stays in a waste gas pipe 4 which extends from the evacuating device 5 to the absorbent-packed container 10 immediately after the completion of wafer treatment, if, in this state, a

large amount of the non-toxic gas is discharged via the bypass valve 7, part of the waste gas which is to be removed may be released in the form of an untreated waste gas. For this reason, it is preferable to purge the waste gas remaining in the pipe 4 with an inert gas introduced through a pipe 6 so that the residual waste gas is fed to the absorbent-packed container 10 before the reaction chamber 14 is evacuated, and then to open the bypass valve 7 to release a large amount of the non-toxic gas in the reaction chamber.

The inert purging gas may be injected into the evacuating device 5 or from an appropriate position which is immediately downstream of it, and the injection of the inert purging gas may be effected either at all times or for a predetermined period of time immediately before the evacuation of the reaction chamber 14. The flow rate of the injected inert gas should be determined by taking into consideration the volume of the pipe, the injection time and so forth. It should be noted that the treated waste gas is discharged through a waste gas pipe 12.

By employing the treatment method and apparatus according to the present invention for dry treatment of waste gas from a semiconductor manufacturing process, it is possible to avoid large variations in the flow rate of gas and therefore possible to carry out efficient and safe treatment without causing a rise in the resistance to gas flow even when an absorbent having a relatively small particle diameter is employed.

More specifically, since a large amount of the non-toxic gas that is discharged from the reaction chamber when evacuated to a level below that of atmospheric pressure is passed through the bypass passage, the flow rate of gas which is fed to the absorbent-packed container is only about several liters per minute. Therefore, even when the particle diameter of the absorbent is reduced considerably to increase the surface area and thereby improve the reaction efficiency, the resistance to gas flow is maintained at a low level. Accordingly, the load on the device used to evacuate the reaction chamber is reduced, and the toxic waste gas treatment can be conducted safely.

Further, since the flow rate of toxic waste gas is low, the time during which the toxic waste gas is in contact with the absorbent is increased and the absorbent utilization efficiency is hence improved by a large margin. Accordingly, it is possible to reduce the amount of absorbent required to effect a certain treatment and hence reduce the size of the packed container. Further, even when solid matter is formed by the reaction of waste gas with the absorbent, the resulting solid matter will not give rise to any significant rise in the resistance to gas flow since the gas flow is considerably low.

By purging the evacuating device and the piping system with an inert gas at all times or immediately before the evacuation of the reaction chamber, it is possible not only to completely feed the toxic gas component to be treated to the absorbent-packed container but also to keep the evacuating device and the piping system clean at all times, which makes it possible to protect the whole of the apparatus from corrosion and other dangerous phenomena. It is also possible to effect purging when the evacuating device or the piping system is disconnected when an inspection or repair work is to be carried out and therefore possible to conduct such an operation safely without any fear of dangerous gas leakages.

As has been described above, in the treatment of a waste gas from a semiconductor process, the large amount of the non-toxic gas which is discharged from the reaction chamber when evacuated to a level below that of atmospheric pressure is not passed through the absorbent-packed container but is released through a bypass pipe, and the toxic gas component to the treated which stays in the pipe leading to the packed container is purged with an inert gas in advance of the evacuation. It is thus possible to enjoy many advantages.

Hereinunder, the present invention will be described more specifically by way of an Example. However, the present invention is in no way restricted by this Example.

Example

An example in which the present invention is applied to an etching device is given hereinbelow.

In Fig. 1 the driving sequence is given and the feature of the present invention is explained.

i) initial stage:

1-1. Cl_2 , 1-2. N_2 are at standstill.

3. main valve ... closed

5. evacuating device ... in perpetual operation

6. purge gas N_2 = 5 l/min, the gas is flowing at all times

7. by-pass valve ... closed

9. pressure sensor ... off

13-1. valve for Cl_2 ... closed

13-2. valve for N_2 ... closed

14. reaction chamber ... opened to atmosphere

ii) A wafer is placed in a reaction chamber 14 and hermetic sealing is made by closing a cover.

iii) The main valve 3 is opened.

iv) 20l of atmospheric air in reaction chamber 14 is vented by the evacuating device 5. Since the air vent rate is 1200 l/min, a large amount of atmospheric air is introduced into an absorbent vessel 10 at the initial stage of venting.

v) Since the design flow is 0 to 30 l/min, the pressure in the absorbent vessel 10 is increased when the initial vent air flows into the vent pipe 4.

vi) By previously opening the bypass valve 7 by the signal of opening the main valve 3, or by sensing the pressure increase by a pressure sensor 9 to open the bypass valve 7, the large amount of the initial vent air is vented mainly through a bypass line 8.

The gas bypassed at this time is solely non-toxic gas as explained below.

vii) Since the atmospheric air in reaction chamber 14 is evacuated in several (1 to 10) seconds, the pressure is not increased when the bypass valve 7 is closed subsequently.

viii) The valve 13-1 for C₁₂ is opened to admit C₁₂ at a rate of 0.5 l/min into the reaction chamber 14 to effect the etching reaction.

ix) After termination of etching, the valve 13-1 for C₁₂ is closed and the valve 13-2 for N₂ is opened so that the atmosphere in the reaction chamber is replaced by N₂.

x) The valve 13-2 for N₂ is closed.

xi) In this state, since the C₁₂ gas is left from the evacuating device 5 to the absorbent vessel, it is not possible to pass to the next bypass sequence. Therefore, the time interval during which the next wafer is set is advantageously employed to introduce the residual C₁₂ gas into the absorbent vessel 10 by the purge gas N₂ 6 to render the gas non-toxic in advance. In this manner, only the non-toxic gas is bypassed at the next bypassing.

xii) The sequence returns to step ii).

Claims

1. An apparatus for treating toxic waste gas discharged from a semiconductor manufacturing process, comprising:

a reaction chamber (14) forming part of a semiconductor manufacturing equipment;

a container (10) packed with dry solid absorbent;

an inlet pipe (4) providing gas communication between the reaction chamber (14) and the container (10);

an outlet pipe (12) providing gas communication between the container (10) and the atmosphere;

an evacuation device (5) disposed between the reaction chamber (14) and the inlet pipe (4), the evacuation device (5) providing gas communication between the reaction chamber (14) and the inlet pipe (4) and adapted to force gas flow from the reaction chamber (14) to the inlet pipe (4);

a main valve (3) provided between the reaction chamber (14) of the semiconductor manufacturing equipment and the evacuating device (5);

bypass pipe (8) providing gas communication between the inlet pipe (4) and the outlet pipe (12);

a bypass valve (7) adapted to open or close the bypass pipe (8), whereby gas will flow through the container (10) when the bypass valve (7) is closed, and will flow through both the container (10) and the bypass pipe (8) when the bypass (7) valve is open; and

an electric circuit for opening and closing the main valve (3) and bypass valve (7).

2. The apparatus of claim 1, characterised in that said bypass valve is opened in response to a signal from a pressure sensor provided at the inlet pipe of said absorbent-packed container.

3. The apparatus of claim 1, characterised in that said electric circuit is provided with a timer and is arranged such that said bypass valve is closed when a predetermined period of time has elapsed after said main and bypass valve have been opened.

4. The apparatus of claim 3, characterised in that said electric circuit is provided with a timer and is arranged such that said bypass valve is closed when a predetermined period of time has elapsed after said bypass valve has been opened in response to a signal from said pressure sensor.

5. A method of treating waste gas from a semiconductor manufacturing process, by using the apparatus as claimed in claim 1, comprising the following steps:

treating the toxic waste gas from the reaction chamber (14) of semiconductor manufacturing equipment under vacuum with a dry solid absorbent;

introducing under vacuum an inert purge gas at a rate of about 1-30 l/min into the reaction chamber (14) for a short period of time sufficient to render the equipment non-toxic after termination of a reaction and treating the toxic component containing gas with the dry solid absorbent;

introducing under vacuum an inert purge gas at a rate of about 1-30 l/min into the evacuating device (5) for a short period of time sufficient to render the evacuating device (5), the inlet pipe (4) of the absorbent-packed container and the bypass pipe (8) Non toxic;

bringing the reaction chamber (14) to at-

v) Since the design flow is 0 to 30 l/min, the pressure in the absorbent vessel 10 is increased when the initial vent air flows into the vent pipe 4.

vi) By previously opening the bypass valve 7 by the signal of opening the main valve 3, or by sensing the pressure increase by a pressure sensor 9 to open the bypass valve 7, the large amount of the initial vent air is vented mainly through a bypass line 8.

The gas bypassed at this time is solely non-toxic gas as explained below.

vii) Since the atmospheric air in reaction chamber 14 is evacuated in several (1 to 10) seconds, the pressure is not increased when the bypass valve 7 is closed subsequently.

viii) The valve 13-1 for C₁₂ is opened to admit C₁₂ at a rate of 0.5 l/min into the reaction chamber 14 to effect the etching reaction.

ix) After termination of etching, the valve 13-1 for C₁₂ is closed and the valve 13-2 for N₂ is opened so that the atmosphere in the reaction chamber is replaced by N₂.

x) The valve 13-2 for N₂ is closed.

xi) In this state, since the C₁₂ gas is left from the evacuating device 5 to the absorbent vessel, it is not possible to pass to the next bypass sequence. Therefore, the time interval during which the next wafer is set is advantageously employed to introduce the residual C₁₂ gas into the absorbent vessel 10 by the purge gas N₂ 6 to render the gas non-toxic in advance. In this manner, only the non-toxic gas is bypassed at the next bypassing.

xii) The sequence returns to step ii).

Claims

1. An apparatus for treating toxic waste gas discharged from a semiconductor manufacturing process, comprising:

a reaction chamber (14) forming part of a semiconductor manufacturing equipment;

a container (10) packed with dry solid absorbent;

an inlet pipe (4) providing gas communication between the reaction chamber (14) and the container (10);

an outlet pipe (12) providing gas communication between the container (10) and the atmosphere;

an evacuation device (5) disposed between the reaction chamber (14) and the inlet pipe (4), the evacuation device (5) providing gas communication between the reaction chamber (14) and the inlet pipe (4) and adapted to force gas flow from the reaction chamber (14) to the inlet pipe (4);

a main valve (3) provided between the reaction chamber (14) of the semiconductor manufacturing equipment and the evacuating device (5);

bypass pipe (8) providing gas communication between the inlet pipe (4) and the outlet pipe (12);

a bypass valve (7) adapted to open or close the bypass pipe (8), whereby gas will flow through the container (10) when the bypass valve (7) is closed, and will flow through both the container (10) and the bypass pipe (8) when the bypass (7) valve is open; and

an electric circuit for opening and closing the main valve (3) and bypass valve (7).

2. The apparatus of claim 1, characterised in that said bypass valve is opened in response to a signal from a pressure sensor provided at the inlet pipe of said absorbent-packed container.

3. The apparatus of claim 1, characterised in that said electric circuit is provided with a timer and is arranged such that said bypass valve is closed when a predetermined period of time has elapsed after said main and bypass valve have been opened.

4. The apparatus of claim 3, characterised in that said electric circuit is provided with a timer and is arranged such that said bypass valve is closed when a predetermined period of time has elapsed after said bypass valve has been opened in response to a signal from said pressure sensor.

5. A method of treating waste gas from a semiconductor manufacturing process, by using the apparatus as claimed in claim 1, comprising the following steps:

treating the toxic waste gas from the reaction chamber (14) of semiconductor manufacturing equipment under vacuum with a dry solid absorbent;

introducing under vacuum an inert purge gas at a rate of about 1-30 l/min into the reaction chamber (14) for a short period of time sufficient to render the equipment non-toxic after termination of a reaction and treating the toxic component containing gas with the dry solid absorbent;

introducing under vacuum an inert purge gas at a rate of about 1-30 l/min into the evacuating device (5) for a short period of time sufficient to render the evacuating device (5), the inlet pipe (4) of the absorbent-packed container and the bypass pipe (8) Non toxic;

bringing the reaction chamber (14) to at-



mospheric pressure;

venting a large amount of a non-toxic gas from the reaction chamber at an atmospheric pressure of about 760 torr (1.33×10^2 Pa) to about $1 \cdot 10^{-5}$ torr (1.33×10^{-3} Pa) mainly through the bypass pipe which is equipped with a bypass valve (7) between inlet pipe (4) of the absorbent-packed container and outlet pipe (12) of the absorbent-packed container.

6. The method of claim 5, characterised in that said bypass valve (7) is opened on the basis of a signal for opening the main valve (3) installed between said reaction chamber and the evacuating device for evacuating it.
7. The method of claim 5, characterised in that a rise in the inlet pressure is detected by means of a pressure sensor (9) disposed on the inlet pipe of said absorbent-packed container to open said bypass valve (7) on the basis of a signal representing the detected rise in the inlet pressure.

Patentansprüche

1. Vorrichtung zum Behandeln toxischen Abfallgases, das aus einem Halbleiterherstellungsprozeß abgelassen wird, wobei die Vorrichtung folgendes aufweist:
eine Reaktionskammer (14), die einen Teil einer Halbleiterherstellungsanlage oder -ausrüstung bildet;
einen Behälter (10), der mit einem trockenen festen Absorptionsmittel gepackt ist;
ein Einlaßrohr (4), das eine Gasverbindung zwischen der Reaktionskammer (14) und dem Behälter (10) vorsieht;
ein Auslaßrohr (12), das eine Gasverbindung zwischen dem Behälter (10) und der Atmosphäre vorsieht;
eine Evakuereinrichtung (5), die zwischen der Reaktionskammer (14) und dem Einlaßrohr (4) angeordnet ist und eine Gasverbindung zwischen der Reaktionskammer (14) und dem Einlaßrohr (4) vorsieht und geeignet ist, einen Gasstrom aus der Reaktionskammer (14) in das Einlaßrohr (4) zwangsweise vorzusehen;
ein Hauptventil (3), das zwischen der Reaktionskammer (14) der Halbleiterherstellungsanlage und der Evakuierungseinrichtung (5) vorgesehen ist;
ein Bypassrohr (8), das eine Gasverbindung zwischen dem Einlaßrohr (4) und dem Auslaßrohr (12) vorsieht;
ein Bypassventil (7), das geeignet ist zum Öffnen oder Schließen des Bypassrohrs (8), wodurch Gas durch den Behälter (10) strömen

wird, wenn das Bypassventil (7) geschlossen ist, und durch sowohl den Behälter (10) als auch das Bypassrohr (8) strömen wird, wenn das Bypassventil (7) offen ist; und einen elektrischen Schaltkreis zum Öffnen und Schließen des Hauptventils (3) und Bypassventils (7).

2. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß das Bypassventil geöffnet wird ansprechend auf ein Signal von einem Drucksensor oder -sensor, der an dem Einlaßrohr des mit Absorptionsmittel gepackten Behälters vorgesehen ist.
3. Vorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß der elektrische Kreis mit einem Zeitmesser oder Timer versehen ist und derart angeordnet ist, daß das Bypassventil geschlossen ist, wenn eine vorbestimmte Zeitperiode vergangen ist, nachdem das Hauptventil und das Bypassventil geöffnet wurden.
4. Vorrichtung nach Anspruch 3, dadurch gekennzeichnet, daß der elektrische Schaltkreis mit einem Zeitmesser oder Timer versehen ist und derart angeordnet ist, daß das Bypassventil geschlossen ist, wenn eine vorbestimmte Zeitperiode vergangen ist, nachdem das Bypassventil geöffnet worden ist ansprechend auf ein Signal von dem Drucksensor.
5. Verfahren zum Behandeln von Abgas aus einem Halbleiterherstellungsprozeß unter Verwendung der Vorrichtung gemäß Anspruch 1, wobei das Verfahren die folgenden Schritte vorsieht:
Behandeln des toxischen Abfallgases aus der Reaktionskammer (14) der Halbleiterherstellungsanlage unter Vakuum mit einem trockenen, festen Absorptionsmittel;
Einführen unter Vakuum eines inerten Spülgases mit einer Rate von ungefähr 1-30 l/min in die Reaktionskammer (14) für eine Zeitperiode, die ausreichend ist, um die Anlage nach Beendigung einer Reaktion nicht toxisch zu machen, und Behandeln des eine toxische Komponente enthaltenden Gases mit dem trockenen, festen Absorptionsmittel;
Einführen unter Vakuum eines inerten Spülgases mit einer Rate von ungefähr 1-30 l/min in die Evakuierungseinrichtung (5) für eine kurze Zeitperiode, die ausreichend ist, um die Evakuierungseinrichtung (5), das Einlaßrohr (4) des mit Absorptionsmittel gepackten Behälters und das Bypassrohr (8) nicht-toxisch zu machen;
Bringen der Reaktionskammer (14) auf atmosphärischen Druck;



Ablassen einer großen Menge eines nicht-toxischen Gases aus der Reaktionskammer von einem atmosphärischen Druck von ungefähr 760 Torr ($1,33 \times 10^2$ Pa) auf ungefähr $1 \cdot 10^{-5}$ Torr ($1,33 \times 10^{-3}$ Pa), und zwar hauptsächlich durch das Bypaßrohr, das mit einem Bypaßventil (7) zwischen dem Einlaßrohr (4) des mit Absorptionsmittel gepackten Behälters und dem Auslaßrohr (12) des mit Absorptionsmittel gepackten Behälters ausgerüstet ist.

6. Verfahren nach Anspruch 5, dadurch gekennzeichnet, daß das Bypaßventil (7) geöffnet wird basierend auf einem Signal zum Öffnen des Hauptventils (3), das zwischen der Reaktionskammer und der Evakuierungseinrichtung eingebaut ist zur Evakuierung.

7. Verfahren nach Anspruch 5, dadurch gekennzeichnet, daß ein Anstieg des Einlaßdrucks mittels eines Druckfühlers- oder sensors (9) abgefühlt wird, der auf dem Einlaßrohr des mit Absorptionsmittel gepackten Behälters angeordnet ist, um das Bypaßventil (7) basierend auf einem Signal zu öffnen, das den abgefühlt Anstieg in dem Einlaßdruck repräsentiert.

Revendications

1. Appareil pour traiter un gaz d'échappement toxique déchargé à partir d'un procédé de fabrication de semiconducteurs, comprenant:
une chambre de réaction (14) formant une partie d'un équipement de fabrication de semiconducteurs;

un conteneur (10) rempli d'un produit absorbant solide sec;

un conduit d'entrée (4) permettant la communication du gaz entre la chambre de réaction (14) et le conteneur (10);

un conduit de sortie (12) permettant la communication du gaz entre le conteneur (10) et l'atmosphère;

un dispositif d'évacuation (5) disposé entre la chambre de réaction (14) et le conduit d'entrée (4), le dispositif d'évacuation (5) permettant la communication du gaz entre la chambre de réaction (14) et le conduit d'entrée (4) et étant adapté pour forcer l'écoulement de gaz depuis la chambre de réaction (14) vers le conduit d'entrée (4);

une soupape principale (3) placée entre la chambre de réaction (14) de l'équipement de fabrication de semiconducteurs et le dispositif d'évacuation (5);

un conduit de dérivation (8) permettant la communication du gaz entre le conduit d'entrée (4) et le conduit de sortie (12);

une soupape de dérivation (7) adaptée pour ouvrir ou fermer le conduit de dérivation (8), de manière que le gaz circule à travers le conteneur (10) lorsque la soupape de dérivation (7) est fermée, et circule à travers à la fois le conteneur (10) et le conduit de dérivation (8) lorsque la soupape de dérivation (7) est ouverte; et

un circuit électrique pour ouvrir et fermer la soupape principale (3) et la soupape de dérivation (7).

2. Appareil selon la revendication 1, caractérisé en ce que ladite soupape de dérivation est ouverte en réponse à un signal d'un capteur de pression prévu dans le conduit d'entrée dudit conteneur rempli de produit absorbant.

3. Appareil selon la revendication 1, caractérisé en ce que ledit circuit électrique comporte un minuteur et est agencé de sorte que ladite soupape de dérivation est fermée lorsqu'une période de temps prédéterminée s'est écoulée après l'ouverture desdites soupapes principale et de dérivation.

4. Appareil selon la revendication 3, caractérisé en ce que ledit circuit électrique comporte un minuteur et est agencé de sorte que ladite soupape de dérivation est fermée lorsqu'une période de temps prédéterminée s'est écoulée après l'ouverture de ladite soupape de dérivation en réponse à un signal dudit capteur de pression.

5. Procédé pour traiter un gaz d'échappement en provenance d'un procédé de fabrication de semiconducteurs, en utilisant l'appareil selon la revendication 1, comprenant les étapes suivantes:

traitement du gaz d'échappement toxique depuis la chambre de réaction (14) de l'équipement de fabrication des semiconducteurs sous vide avec un produit absorbant solide sec;

introduction sous vide d'un gaz de purge inerte à une vitesse d'environ 1-30 l/min dans la chambre de réaction (14) pendant une courte période de temps suffisante pour rendre l'équipement non toxique après la fin d'une réaction et traitement du gaz contenant un composant toxique avec le produit absorbant solide sec ;

introduction sous vide d'un gaz de purge inerte à une vitesse d'environ 1-30 l/min dans le dispositif d'évacuation (5) pendant une courte période de temps suffisante pour rendre le dispositif d'évacuation (5), le conduit d'entrée



(4) du conteneur rempli de produit absorbant et le conduit de dérivation (8) non toxiques; amenée de la chambre de réaction (14) à la pression atmosphérique;

décharge d'une grande quantité d'un gaz non toxique depuis la chambre de réaction à une pression atmosphérique d'environ 760 torr ($1,33 \times 10^2$ Pa) à environ $1 \cdot 10^{-5}$ torr ($1,33 \times 10^{-3}$ Pa) principalement par l'intermédiaire du conduit de dérivation qui est équipé d'une soupape de dérivation (7) entre le conduit d'entrée (4) du conteneur rempli de produit absorbant et le conduit de sortie (12) du conteneur rempli de produit absorbant.

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6. Procédé selon la revendication 5, caractérisé en ce que ladite soupape de dérivation (7) est ouverte en fonction d'un signal pour ouvrir la soupape principale (3) placée entre ladite chambre de réaction et le dispositif d'évacuation, pour l'évacuer.

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7. Procédé selon la revendication 5, caractérisé en ce qu'une élévation de la pression d'entrée est détectée au moyen d'un capteur de pression (9) disposé sur le conduit d'entrée dudit conteneur rempli de produit absorbant afin d'ouvrir ladite soupape de dérivation (7) en fonction d'un signal représentant l'élévation détectée de la pression d'entrée.

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