

Description

The present invention relates generally to evacuation of a vacuum vessel and, more particularly, to a method and apparatus for evacuation for efficiently discharging hydrogen from a vacuum vessel.

To evacuate a vacuum vessel to the extent of producing a high or ultra-high vacuum, a turbo-molecular pump has been conventionally used. Such type of pumps, however, have a drawback in that they cannot sufficiently discharge light weight gases such as hydrogen from a vacuum vessel since their ability to evacuate light weight gases having a relatively low molecular weight, such as hydrogen is insufficient.

JP-A 60 36 789 describes a method and device for obtaining clean high vacuum wherein a hydrogen occluding material is placed at the side of a back pressure of a turbo particle pump, the hydrogen at the back pressure side is absorbed by the hydrogen occluding material to reduce the partial hydrogen pressure at the back pressure side and the arriving degree of vacuum of the turbo particle pump is increased.

An object of the present invention is therefore to obviate the above-mentioned drawback by providing a method and apparatus for discharging hydrogen from a vacuum exhaust system to evacuate the interior of a vacuum vessel to produce a high level of vacuum.

Another object of the invention is to provide a method and apparatus which are capable of easily discharging hydrogen under high vacuum range as well as low vacuum range with a simple arrangement while fulfilling the above object.

A further object of the invention is to provide a method and apparatus which are applicable to a conventional vacuum exhaust system including a single or plurality of turbo-molecular pumps while fulfilling the above objects.

To achieve the above-mentioned object, according to one aspect of the present invention, a method of the present invention comprises a step of discharging hydrogen from a vacuum vessel by means of a roughing vacuum pump and a turbo-molecular pump and is characterized by the inclusion of a step of introducing, while discharging hydrogen from the vacuum vessel, a material which has excellent reactivity with hydrogen into the exhaust system. Also, an apparatus of the present invention comprises a roughing vacuum pump and a turbo-molecular pump for evacuating a vacuum vessel, the apparatus being characterized in that in an exhaust system between the vacuum vessel and the roughing vacuum pump an inlet is provided for the introduction of a material which has excellent reactivity with hydrogen.

According to another aspect of the present invention, a method of the present invention comprises a step of discharging hydrogen from a vacuum vessel

by means of a roughing pump and a turbo-molecular pump and is characterized by the inclusion of the steps of introducing, during discharge of hydrogen from the vacuum vessel, a material which has excellent reactivity with hydrogen into the exhaust system, while exciting or ionizing such a material to promote reaction with hydrogen. Likewise, an evacuating apparatus according to another aspect of the invention comprises a roughing vacuum pump and a turbo-molecular pump for evacuating a vacuum vessel, and is characterized in that in an exhaust system between the vacuum vessel and the roughing vacuum pump an inlet for the introduction of the material which has excellent reactivity with hydrogen is provided together with means for exciting or ionizing such a material.

The means for exciting or ionizing the material of excellent reactivity may comprise at least one of: application of microwaves; application of heat energy; irradiation with ultraviolet or laser radiation; irradiation with a beam of electrons or charged particles; irradiation with an ionizing wave or atomic beam; application of magnetic or electrical field; generation of a plasma; loading of a source of heat rays or heater; imparting an elastic wave; and charging a reaction-promoting material such as a catalyst.

The material, which has excellent reactivity with hydrogen may be any material which displays such properties. Such a material, however, should preferably be a gas or a material which can be readily gasified, such as halogens, ozone, etc., since a material is introduced into the exhaust system as a gas.

If the material used is a liquid or solid, a gasifying chamber, in which such material is gasified by some means such as pressure reduction or temperature increase, is provided before an inlet point for the material into the vacuum exhaust system.

To introduce into the vacuum exhaust system the gasified material for reaction with hydrogen, an inlet may be provided at one or more places on the suction port-side, interior, or exhaust-port-side of the turbo-molecular pump. A single, or a plurality of turbo-molecular pumps may be used. In the latter case, a reaction chamber for exciting or ionizing the material therein may be arranged between the turbo-molecular pumps, and the inlet for the introduction of the material may be provided at one or several points in the turbo-molecular pumps including the reaction chamber.

As stated above, in the present invention, means for exciting or ionizing the material, which has excellent reactivity with hydrogen, should preferably be provided before the introduction into the vacuum exhaust system or the introduced gas should preferably be excited or ionized in a reaction chamber which is provided between the turbo-molecular pumps so that the introduced gas can rapidly react with hydrogen.

In accordance with the method and apparatus of the present invention, a material which has excellent

reactivity with hydrogen is introduced into the path of the vacuum exhaust system where it reacts with hydrogen to convert hydrogen into another substance of larger molecular weight, whereby the evacuating performance of the vacuum exhaust system is improved with respect to the function of discharging hydrogen.

For example, halogen gases, such as chlorine or fluorine, have excellent reactivity with hydrogen. Chlorine and hydrogen, when reacted with each other, will form hydrogen chloride HCl whose molecular weight (36.5) is about 18 times as large as hydrogen H₂ (2). In this case, since the compression ratio of the turbo-molecular pump has a value for hydrogen chloride which is about 10⁹ times (calculated value) as large as the value for hydrogen, the hydrogen-discharging function is improved.

The above and other objects, features and advantages of the present invention will become more apparent from the following description when taken in conjunction with the accompanying drawings in which preferred embodiments of the present invention are shown by way of illustrative examples.

Figs. 1 and 2 are diagrams conceptionally showing preferred embodiments of the evacuating apparatus according to the present invention.

Embodiment 1

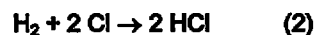
Fig. 1 is a diagram conceptionally showing an embodiment of the evacuating apparatus according to the present invention. In Fig. 1, a vacuum vessel A is initially evacuated by a roughing vacuum pump C and then it is further evacuated by a turbo-molecular pump B to high vacuum. In accordance with the present invention, a reactant which has excellent reactivity with hydrogen is introduced into the evacuating apparatus during evacuating operation. If the reactant is not a gas, then it is initially gasified in a gasifying chamber D, excited in an exciting section E₁, and is then introduced into the turbo-molecular pump B, and the suction and exhaust ports, G₁ and G₃, respectively, of the turbo-molecular pump.

A description is given with respect to an example case where chlorine is used as the reactant. If the exciting chamber E₁ is arranged outside the vacuum exhaust system, then chlorine gas is initially introduced into the exciting chamber E₁. In this case, the gasifying chamber D is unnecessary since chlorine is in gaseous form at ordinary temperatures and at ordinary pressures. In this case, the following reaction:



is caused by introducing a microwave into the exciting chamber E₁ to form a plasma state while maintaining the pressure in the exciting chamber E₁ at about 1 Torr, whereby chlorine radicals are generated. Such chlorine radicals are introduced into the vacuum exhaust system through the inlets for material and, within the vacuum exhaust system, the following reaction

will occur:

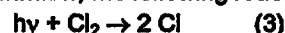


Embodiment 2

Fig. 2 is a diagram conceptionally showing another embodiment of the evacuating apparatus according to the present invention. In Fig. 2, two turbo-molecular pumps B₁ and B₂ are arranged in series, between which a reaction chamber E₂ is provided. A reactant is excited in this reaction chamber. In this reaction chamber E₂, irradiation is effected with ultraviolet rays through a light-transmitting window of quartz, for example.

In this apparatus, the reactant is initially gasified in the gasifying chamber D and is then introduced into the suction port G₁ and the interior of the turbo-molecular pump B₁, the reaction chamber E₂ and the exhaust port G₃ of the turbo-molecular pump B₂, where it reacts with hydrogen.

In this case, if chlorine is introduced as the reactant and irradiation is effected with ultraviolet radiation in the reaction chamber E₂ through a light-transmitting window, the following reaction will occur:



whereby chlorine radicals are generated. Subsequently, the reaction of formula (2) occurs within the vacuum exhaust system and generates hydrogen chloride.

Hydrogen chloride thus formed can be promptly discharged by the turbo-molecular pumps since it has a high molecular weight, i.e. 36.5, as described previously.

Thus, with the use of the method and apparatus according to the present invention, it is possible to easily discharge hydrogen under high vacuum, which has been very difficult to perform with conventional turbo-molecular pumps. For example, it allows the pressure to promptly reach a range of values not higher than 10⁻¹⁰ Torr (ultra high vacuum). It also makes it possible to discharge, even under a low vacuum range, a substantial amount of hydrogen which could not be discharged by ordinary turbo-molecular pumps so far.

Claims

1. A method for discharging hydrogen from a vacuum vessel by means of a roughing vacuum pump and a turbo-molecular pump and by means of a material reacting with hydrogen, characterized by the inclusion of the step of introducing, during discharge of hydrogen from the vacuum vessel, a material which has excellent reactivity with hydrogen into the exhaust system.
2. A method for discharging hydrogen from a va-



reactivity with hydrogen is introduced into the path of the vacuum exhaust system where it reacts with hydrogen to convert hydrogen into another substance of larger molecular weight, whereby the evacuating performance of the vacuum exhaust system is improved with respect to the function of discharging hydrogen.

For example, halogen gases, such as chlorine or fluorine, have excellent reactivity with hydrogen. Chlorine and hydrogen, when reacted with each other, will form hydrogen chloride HCl whose molecular weight (36.5) is about 18 times as large as hydrogen H₂ (2). In this case, since the compression ratio of the turbo-molecular pump has a value for hydrogen chloride which is about 10⁹ times (calculated value) as large as the value for hydrogen, the hydrogen-discharging function is improved.

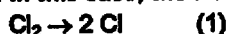
The above and other objects, features and advantages of the present invention will become more apparent from the following description when taken in conjunction with the accompanying drawings in which preferred embodiments of the present invention are shown by way of illustrative examples.

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Embodiment 1

Fig. 1 is a diagram conceptionally showing an embodiment of the evacuating apparatus according to the present invention. In Fig. 1, a vacuum vessel A is initially evacuated by a roughing vacuum pump C and then it is further evacuated by a turbo-molecular pump B to high vacuum. In accordance with the present invention, a reactant which has excellent reactivity with hydrogen is introduced into the evacuating apparatus during evacuating operation. If the reactant is not a gas, then it is initially gasified in a gasifying chamber D, excited in an exciting section E₁, and is then introduced into the turbo-molecular pump B, and the suction and exhaust ports, G₁ and G₃, respectively, of the turbo-molecular pump.

A description is given with respect to an example case where chlorine is used as the reactant. If the exciting chamber E₁ is arranged outside the vacuum exhaust system, then chlorine gas is initially introduced into the exciting chamber E₁. In this case, the gasifying chamber D is unnecessary since chlorine is in gaseous form at ordinary temperatures and at ordinary pressures. In this case, the following reaction:



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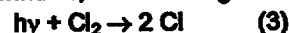


Embodiment 2

Fig. 2 is a diagram conceptionally showing another embodiment of the evacuating apparatus according to the present invention. In Fig. 2, two turbo-molecular pumps B₁ and B₂ are arranged in series, between which a reaction chamber E₂ is provided. A reactant is excited in this reaction chamber. In this reaction chamber E₂, irradiation is effected with ultraviolet rays through a light-transmitting window of quartz, for example.

In this apparatus, the reactant is initially gasified in the gasifying chamber D and is then introduced into the suction port G₁ and the interior of the turbo-molecular pump B₁, the reaction chamber E₂ and the exhaust port G₃ of the turbo-molecular pump B₂, where it reacts with hydrogen.

In this case, if chlorine is introduced as the reactant and irradiation is effected with ultraviolet radiation in the reaction chamber E₂ through a light-transmitting window, the following reaction will occur:



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Hydrogen chloride thus formed can be promptly discharged by the turbo-molecular pumps since it has a high molecular weight, i.e. 36.5, as described previously.

Thus, with the use of the method and apparatus according to the present invention, it is possible to easily discharge hydrogen under high vacuum, which has been very difficult to perform with conventional turbo-molecular pumps. For example, it allows the pressure to promptly reach a range of values not higher than 10⁻¹⁰ Torr (ultra high vacuum). It also makes it possible to discharge, even under a low vacuum range, a substantial amount of hydrogen which could not be discharged by ordinary turbo-molecular pumps so far.

Claims

1. A method for discharging hydrogen from a vacuum vessel by means of a roughing vacuum pump and a turbo-molecular pump and by means of a material reacting with hydrogen, characterized by the inclusion of the step of introducing, during discharge of hydrogen from the vacuum vessel, a material which has excellent reactivity with hydrogen into the exhaust system.

2. A method for discharging hydrogen from a va-



- vacuum vessel by means of a roughing vacuum pump and a turbo-molecular pump, characterized by the inclusion of the steps of introducing, during discharge of hydrogen from the vacuum vessel, a material which has excellent reactivity with hydrogen into the exhaust system, while exciting or ionizing such material to promote the reaction of such a material with hydrogen.
3. The method for discharging hydrogen from a vacuum vessel as claimed in claim 2, wherein said exciting or ionizing of the material of excellent reactivity is effected by means of at least one of: application of microwave; application of heat energy; irradiation with ultraviolet or laser radiation; irradiation with a beam of electrons or charged particles; irradiation with an ionizing wave or atomic beam; application of a magnetic or electrical field; generation of a plasma; loading of a source of heat rays or heater; imparting an elastic wave; and charging a reaction-promoting material such as a catalyst.
 4. The method for discharging hydrogen from a vacuum vessel as claimed in any one of claims 1 to 3, wherein said material is a gas or a material which can be readily gasified like halogens or ozone.
 5. The method for discharging hydrogen from a vacuum vessel as claimed in claim 4, wherein said gas is chlorine or fluorine.
 6. The method for discharging hydrogen from a vacuum vessel as claimed in claim 2 or 3, wherein said exciting or ionizing of said material is effected before introduction of said material into said exhaust system.
 7. The method for discharging hydrogen from a vacuum vessel as claimed in claim 2 or 3, wherein said exciting or ionizing of said material is effected in a reaction chamber provided in said exhaust system.
 8. An apparatus for discharging hydrogen from a vacuum vessel comprising a roughing vacuum pump and a turbo-molecular pump connected to a vacuum vessel, the apparatus being characterized in that in an exhaust system between the vacuum vessel and the roughing vacuum pump an inlet is provided for the introduction of a material which has excellent reactivity with hydrogen.
 9. An apparatus for discharging hydrogen from a vacuum vessel comprising a roughing vacuum pump and a turbo-molecular pump connected to a vacuum vessel, the apparatus being characterized in that in an exhaust system between the vacuum vessel and the roughing vacuum pump an inlet for the introduction of the material which has excellent reactivity with hydrogen is provided together with means for exciting or ionizing such a material.
 10. The apparatus for discharging hydrogen from a vacuum vessel as claimed in claim 9, wherein said means for exciting or ionizing the material of excellent reactivity comprises at least one of: application of microwaves; application of heat energy; irradiation with ultraviolet or laser radiation; irradiation with a beam of electrons or charged particles; irradiation with an ionizing wave or atomic beam; application of a magnetic or electrical field; generation of a plasma; loading of a source of heat rays or heater; imparting an elastic wave; and charging with a reaction-promoting material such as a catalyst.
 11. The apparatus for discharging hydrogen from a vacuum vessel as claimed in any one of claims 8 to 10, wherein said inlet is suitable for introducing a gas or a material which can be readily gasified like halogens or ozone.
 12. The apparatus for discharging hydrogen from a vacuum vessel as claimed in claim 11, wherein said gas is chlorine or fluorine.
 13. The apparatus for discharging hydrogen from a vacuum vessel as claimed in any one of claims 8 to 10, wherein said apparatus includes a gasifying chamber for gasifying said material before introduction of said material into said exhaust system.
 14. The apparatus for discharging hydrogen from a vacuum vessel as claimed in any one of claims 8 to 10, wherein said apparatus includes a single turbo-molecular pump and a reaction chamber connected to said turbo-molecular pump for effecting exciting or ionizing of said material therein.
 15. The apparatus for discharging hydrogen from a vacuum vessel as claimed in claim 14, wherein said inlet is provided in said turbo-molecular pump, and suction and exhaust ports of said turbo-molecular pump.
 16. The apparatus for discharging hydrogen from a vacuum vessel as claimed in any one of claims 8 to 10, wherein said apparatus includes a plurality of turbo-molecular pumps and a reaction chamber connected between said turbo-molecular pumps for effecting exciting or ionizing of said material therein.



17. The apparatus for discharging hydrogen from a vacuum vessel as claimed in claim 16, wherein said inlet is provided in said turbo-molecular pumps, suction and exhaust ports of said turbo-molecular pumps and said reaction chamber.

nem Vakuumbehälter nach Anspruch 4, wobei das Gas Chlor oder Fluor ist.

Patentansprüche

1. Ein Verfahren zum Abgeben von Wasserstoff aus einem Vakuumbehälter mittels einer Grobvakuumpumpe und einer Turbomolekularpumpe und mittels eines Materials, das mit Wasserstoff reagiert, gekennzeichnet durch den Schritt des Einführens eines Materials in das Auslaßsystem, das eine hervorragende Reaktivität oder Reaktionsfähigkeit mit Wasserstoff besitzt, und zwar während des Abgebens von Wasserstoff aus dem Vakuumbehälter.
2. Verfahren zum Abgeben von Wasserstoff aus einem Vakuumbehälter mittels einer Grobvakuumpumpe und einer Turbomolekularpumpe gekennzeichnet durch das Einschließen des Schritts des Einführens eines Materials in das Auslaßsystem, das eine hervorragende Reaktivität mit Wasserstoff besitzt, und zwar während des Abgebens von Wasserstoff aus dem Vakuumbehälter, während ein solches Material erregt oder ionisiert wird, um die Reaktion eines solchen Materials mit Wasserstoff zu fördern.
3. Verfahren zum Abgeben von Wasserstoff aus einem Vakuumbehälter nach Anspruch 2, wobei das Erregen oder Ionisieren des Materials mit hervorragender Reaktivität bewirkt wird durch mindestens eines der folgenden:
Anlegen einer Mikrowelle; Anlegen von Wärmeenergie; Bestrahlung mit ultravioletter oder Laserstrahlung; Bestrahlung mit einem Strahl von Elektronen oder geladenen Partikeln; Bestrahlung mit einer ionisierenden Welle oder einem Atomstrahl; Anlegen eines magnetischen oder elektrischen Feldes; Erzeugen eines Plasmas; Laden einer Quelle von Wärmestrahlen oder einer Heizvorrichtung; Anlegen einer elastischen Welle; und Laden oder zuführen eines reaktionsfördernden Materials, wie zum Beispiel eines Katalysators.
4. Verfahren zum Abgeben von Wasserstoff aus einem Vakuumbehälter nach einem der Ansprüche 1 bis 3, wobei das Material ein Gas ist oder ein Material ist, das leicht vergast werden kann, wie zum Beispiel Halogene oder Ozon.
5. Verfahren zum Abgeben von Wasserstoff aus ei-

6. Verfahren zum Abgeben von Wasserstoff aus einem Vakuumbehälter nach Anspruch 2 oder 3, wobei das Erregen oder Ionisieren des Materials bewirkt wird vor dem Einführen des Materials in das Auslaßsystem.

7. Verfahren zum Abgeben von Wasserstoff aus einem Vakuumbehälter nach Anspruch 2 oder 3, wobei das Erregen oder Ionisieren des Materials in einer Reaktionskammer, die in dem Auslaßsystem vorgesehen ist, bewirkt wird.

8. Vorrichtung zum Abgeben von Wasserstoff aus einem Vakuumbehälter, die eine Grobvakuumpumpe und eine Turbomolekularpumpe aufweist, die mit einem Vakuumbehälter verbunden sind, wobei die Vorrichtung dadurch gekennzeichnet ist, daß in einem Auslaßsystem zwischen dem Vakuumbehälter und der Grobvakuumpumpe ein Einlaß vorgesehen ist für die Einführung eines Materials, das eine hervorragende Reaktivität mit Wasserstoff besitzt.

9. Vorrichtung zum Abgeben von Wasserstoff aus einem Vakuumbehälter, die eine Grobvakuumpumpe und eine Turbomolekularpumpe aufweist, die mit einem Vakuumbehälter verbunden sind, wobei die Vorrichtung dadurch gekennzeichnet ist, daß in einem Auslaßsystem zwischen dem Vakuumbehälter und der Grobvakuumpumpe ein Einlaß für das Einführen eines Materials, das eine hervorragende Reaktivität mit Wasserstoff besitzt, vorgesehen ist, zusammen mit Mitteln zum Erregen oder Ionisieren eines solchen Materials.

10. Vorrichtung zum Abgeben von Wasserstoff aus einem Vakuumbehälter nach Anspruch 9, wobei die Mittel zum Erregen oder Ionisieren des Materials mit hervorragender Reaktivität mindestens eines der folgenden aufweist: Anlegen von Mikrowellen; Anlegen von Wärmeenergie; Bestrahlung mit ultravioletten oder Laserstrahlen; Bestrahlung mit einem Strahl von Elektronen oder geladenen Partikeln; Bestrahlen mit einer ionisierenden Welle oder einem Atomstrahl; Anlegen eines magnetischen oder elektrischen Feldes; Erzeugen eines Plasmas; Laden einer Quelle von Wärmestrahlen oder einer Heizvorrichtung; Anlegen einer elastischen Welle; und Laden oder zuführen eines reaktionsfördernden Materials, wie zum Beispiel eines Katalysators.

11. Vorrichtung zum Abgeben von Wasserstoff aus einem Vakuumbehälter nach einem der Ansprüche 8 bis 10, wobei der Einlaß geeignet ist zum



Einführen eines Gases oder eines Materials, das leicht vergast werden kann, wie zum Beispiel Halogene oder Ozon.

12. Vorrichtung zum Abgeben von Wasserstoff aus einem Vakuumbehälter nach Anspruch 11, wobei das Gas Chlor oder Fluor ist. 5
13. Vorrichtung zum Abgeben von Wasserstoff aus einem Vakuum nach einem der Ansprüche 8 bis 10, wobei die Vorrichtung eine Vergasungskammer umfaßt zum Vergasen des Materials vor dem Einführen des Materials in das Auslaßsystem. 10
14. Vorrichtung zum Abgeben von Wasserstoff aus einem Vakuumbehälter nach einem der Ansprüche 8 bis 10, wobei die Vorrichtung eine einzelne Turbomolekularpumpe und eine Reaktionskammer umfaßt, die mit der Turbomolekularpumpe verbunden ist zum Bewirken des Erregens oder Ionisierens des Materials darinnen. 15
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15. Vorrichtung zum Abgeben von Wasserstoff aus einem Vakuumbehälter nach Anspruch 14, wobei der Einlaß vorgesehen ist in der Turbomolekularpumpe, und den Ansaug- und Auslaßanschlüssen der Turbomolekularpumpe. 25
16. Vorrichtung zum Abgeben von Wasserstoff aus einem Vakuumbehälter nach einem der Ansprüche 8 bis 10, wobei die Vorrichtung eine Vielzahl von Turbomolekularpumpen und eine Reaktionskammer aufweist, die zwischen den Turbomolekularpumpen verbunden ist zum Bewirken des Erregens oder Ionisierens des Materials darinnen. 30
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17. Vorrichtung zum Abgeben von Wasserstoff aus einem Vakuumbehälter nach Anspruch 16, wobei der Einlaß vorgesehen ist in den Turbomolekularpumpen, den Ansaug- und Auslaßanschlüssen der Turbomolekularpumpen und der Reaktionskammer. 40
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Revendications

1. Procédé d'évacuation d'hydrogène d'un récipient sous vide à l'aide d'une pompe à vide grossier et d'une pompe turbomoléculaire, et à l'aide d'un matériau réagissant avec l'hydrogène, caractérisé par l'incorporation d'une étape d'introduction, pendant l'évacuation d'hydrogène du récipient sous vide, d'une matière présentant une excellente réactivité vis-à-vis de l'hydrogène dans le circuit d'évacuation. 50
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2. Procédé d'évacuation d'hydrogène d'un récipient 6

sous vide à l'aide d'une pompe à vide grossier et d'une pompe turbomoléculaire, caractérisé par l'incorporation d'étapes d'introduction, pendant l'évacuation d'hydrogène du récipient sous vide, d'une matière possédant une excellente réactivité vis-à-vis de l'hydrogène dans le circuit d'évacuation, avec excitation ou ionisation d'une telle matière afin que la réaction de cette matière avec l'hydrogène soit favorisée.

3. Procédé d'évacuation d'hydrogène d'un récipient sous vide selon la revendication 2, dans lequel l'excitation ou l'ionisation de la matière d'excellente réactivité est réalisée par l'un au moins des moyens suivants : l'application d'hyperfréquences, l'application d'énergie thermique, l'irradiation par un rayonnement ultraviolet ou laser, l'irradiation par un faisceau d'électrons ou de particules chargées, l'irradiation par une onde ou un faisceau atomique d'ionisation, l'application d'un champ magnétique ou électrique, la création d'un plasma, le chargement d'une source de rayons thermiques ou d'un organe de chauffage, l'application d'une onde élastique, et le chargement d'une matière favorisant la réaction, telle qu'un catalyseur.
4. Procédé d'évacuation d'hydrogène d'un récipient sous vide selon l'une quelconque des revendications 1 à 3, dans lequel ladite matière est un gaz ou une matière qui peut être facilement gazéifiée, tel que des halogènes ou l'ozone.
5. Procédé d'évacuation d'hydrogène d'un récipient sous vide selon la revendication 4, dans lequel ledit gaz est le chlore ou le fluor.
6. Procédé d'évacuation d'hydrogène d'un récipient sous vide selon la revendication 2 ou 3, dans lequel l'excitation ou l'ionisation de la matière est réalisée avant introduction de ladite matière dans le circuit d'évacuation.
7. Procédé d'évacuation d'hydrogène d'un récipient sous vide selon la revendication 2 ou 3, dans lequel l'excitation ou l'ionisation de ladite matière est réalisée dans une chambre de réaction placée dans le circuit d'évacuation.
8. Appareil d'évacuation d'hydrogène d'un récipient sous vide, comprenant une pompe à vide grossier et une pompe turbomoléculaire raccordées à un récipient sous vide, l'appareil étant caractérisé en ce que, dans un circuit d'évacuation compris entre le récipient sous vide et la pompe à vide grossier, une entrée est formée pour l'introduction d'une matière qui présente une excellente réactivité vis-à-vis de l'hydrogène.



9. Appareil d'évacuation d'hydrogène d'un récipient sous vide, comprenant une pompe à vide grossier et une pompe turbomoléculaire raccordées à un récipient sous vide, l'appareil étant caractérisé en ce que, dans un circuit d'évacuation placé entre le récipient sous vide et la pompe à vide grossier, une entrée destinée à l'introduction de la matière ayant une excellente réactivité avec l'hydrogène est formée avec des moyens d'excitation ou d'ionisation d'une telle matière. 5 10
10. Appareil d'évacuation d'hydrogène d'un récipient sous vide selon la revendication 9, dans lequel lesdits moyens d'excitation ou d'ionisation de la matière ayant une excellente réactivité comprend au moins un moyen parmi l'application d'hyperfréquences, l'application d'énergie thermique, l'irradiation par un rayonnement ultraviolet ou laser, l'irradiation par un faisceau d'électrons ou de particules chargées, l'irradiation par une onde ou un faisceau atomique d'ionisation, l'application d'un champ magnétique ou électrique, la création d'un plasma, le chargement d'une source de rayons thermiques ou un organe de chauffage, l'application d'une onde élastique, et le chargement d'une matière favorisant la réaction, par exemple d'un catalyseur. 15 20 25
11. Appareil d'évacuation d'hydrogène d'un récipient sous vide selon l'une quelconque des revendications 8 à 10, dans lequel ladite entrée permet l'introduction d'un gaz ou d'une matière qui peut être facilement gazéifié, tel que des halogènes ou l'ozone. 30 35
12. Appareil d'évacuation d'hydrogène d'un récipient sous vide selon la revendication 11, dans lequel le gaz est le chlore ou le fluor. 40
13. Appareil d'évacuation d'hydrogène d'un récipient sous vide selon l'une quelconque des revendications 8 à 10, dans lequel l'appareil comprend une chambre de gazéification pour gazéifier ladite matière avant introduction de ladite matière dans le circuit d'évacuation. 45
14. Appareil d'évacuation d'hydrogène d'un récipient sous vide selon l'une quelconque des revendications 8 à 10, dans lequel l'appareil comprend une pompe turbomoléculaire unique et une chambre réactionnelle raccordée à la pompe turbomoléculaire afin qu'elle assure l'excitation ou l'ionisation de ladite matière placée à l'intérieur. 50
15. Appareil d'évacuation d'hydrogène d'un récipient sous vide selon la revendication 14, dans lequel l'entrée est placée dans ladite pompe turbomoléculaire, et aux orifices d'aspiration et d'évacua- 55

tion de ladite pompe turbomoléculaire.

16. Appareil d'évacuation d'hydrogène d'un récipient sous vide selon l'une des revendications 8 à 10, dans lequel l'appareil comprend plusieurs pompes turbomoléculaires et une chambre réactionnelle raccordée entre lesdites pompes turbomoléculaires afin d'assurer l'excitation ou l'ionisation de la matière placée à l'intérieur.

17. Appareil d'évacuation d'hydrogène d'un récipient sous vide selon la revendication 16, dans lequel ladite entrée est placée dans les pompes turbomoléculaires, les orifices d'aspiration et d'évacuation des pompes turbomoléculaires et la chambre de réaction.