[0019] Fig. 2 is a schematic diagram showing a configuration of an exemplary chemical liquid manufacturing apparatus according to some embodiments of the present disclosure.

DETAILED DESCRIPTION

[0020] The following disclosure provides different embodiments or examples, for implementing various features of the current subject matter. Specific examples of components and arrangements are described below to simplify the present disclosure. These are merely examples and are not intended to be limiting. For example, when the term "solvent(s)" is used, unless otherwise noted, it may refer to a single solvent or a combination of two or more solvents.

[0021] Further, spatially relative terms, such as "beneath," "below," "lower," "above," "upper" and the like, may be used herein for ease of description to describe one element or feature's relationship to another element(s) or feature(s) as illustrated in the figures. The spatially relative terms are intended to encompass different orientations of the device in use or operation in addition to the orientation depicted in the figures. The apparatus may be otherwise oriented (rotated 90 degrees or at other orientations) and the spatially relative descriptors used herein may likewise be interpreted accordingly.

[0022] In the present disclosure, a numerical range indicated by using a term "to" means a range which includes numerical values described before and after the term of "to", as a lower limit value and an upper limit value.

[0023] In the present disclosure, "ppm" means "parts-per-million (10^{-6})", "ppb" means "parts-per-billion (10^{-9})" and "ppt" means "parts-per-trillion(10^{-12})".

[0059] As shown in Figure 1, the chemical liquid manufacturing apparatus 10 at least includes one heat exchanger 100 for setting the temperature of the processing target material to an optimal processing range, wherein the heat exchanger 100 is connected to the processing target supply unit 20 directly or indirectly, for example, through an introduction conduit 160a; a first material treatment system 110 coupled to the heat exchanger 100 via a first transfer conduit 160b, wherein the first material treatment system 110 includes one or plural filtration media (solid horizontal lines designated by the reference numeral 114), and the first transfer conduit 160b is connected between the heat exchanger 100 and, for example, a supply port 110a of the first material treatment system 110.

[0060] In certain exemplary embodiments, the one or plural filtration media 114 may be compartmentalized and contained in one or plural housings 112, respectively. For example, the first material treatment system 110 may include at least one housing 112 selected from a first housing 112a, a second housing112b, a third housing 112c, and the at least one housing 112 includes and accommodates one or plural units of filtration medium 114 therein. Alternatively speaking, according to the examples above, the first material treatment system 110 may include just one housing 112 (either the first housing 112a, the second housing112b, or the third housing 112c), or two housings 112 (a combination of any two of the first housing 112a, the second housing112b, and the third housing 112c), or three housings (the first housing 112a, the second housing112b, and the third housing 112c). It is noted that the above examples are for illustrative purposes, and the number of housings is not limited to the shown examples. In

other exemplary embodiments, the first material treatment system 110 may include more housings 112, for example, one, two, five, or ten more, in addition to the first housing 112a, the second housing112b, and the third housing 112c. Further, there may be no separate housings 112, and the one or plural filtration media 114 are configured un-compartmentalized in the first material treatment system 110. In yet other exemplary embodiments, the first material treatment system 110 may also include other material treatment modules (not shown) in addition to the one or plural filtration media 114.

[0061] According to some embodiments of the disclosure, the first material treatment system 110 may be connected to a collection tank 130 via a second transfer conduit 160c, wherein the second transfer conduit 160c is connected between, for example, an outflow port 110b of the first material treatment system 110 and the collection tank 130. It is understood that pumps and valves are installed at the various conduits, outflow ports and supply ports at the processing target supply unit 20, the heat exchanger 100, the first material treatment system 110, the collection tank 130, etc. as necessary.

[0062] The chemical liquid manufacturing apparatus 10 further includes a second material treatment system 120 which communicates with the first material treatment system 110 either directly or indirectly, for example, by connecting to the collection tank 130 via a third transfer conduit 160d, wherein the third transfer conduit 160d is connected between the collection tank 130 and a supply port 120a, and the second material treatment system 120 includes one or plural filtration media 124; a fourth transfer conduit 160e coupling the second material treatment

system 120 to a next processing apparatus or packaging 140, wherein the fourth transfer conduit 160e may be connected to an outflow port 120b of the second material treatment system 120; a recirculating conduit 160f which may be branched from the fourth transfer conduit 160e and is connected to the collection tank 130 for recirculating and supplying the partially-purified processing target to be processed by the second material treatment system 120 again; and a sample detector 150, which is coupled to the second material treatment system 120 for monitoring the impurity contents in the chemical liquid. It is understood that pumps and valves are installed at the various conduits, outflow ports and supply ports at the second material treatment system 120, the next processing apparatus or packaging 140, the sample detector 150, etc. as necessary.

[0063] In certain exemplary embodiments of the disclosure, the one or plural filtration media 124 may be compartmentalized and contained in one or plural housings 122, respectively. For example, the second material treatment system 120 may include at least one housing 122 selected from a fourth housing 122a, a fifth housing 122b and a sixth housing 122c, and the at least one housing 122 includes and accommodates one or plural units of filtration medium 124 therein. Alternatively speaking, according to the examples above, the second material treatment system 120 may include one, two, or three housings 122. It is noted that the above examples are for illustrative purposes and the number of housings is not limited to the shown examples. In other exemplary embodiments, the second material treatment system 120 may include more housings 122, for example, one, two, five, or ten more, in addition to the fourth housing 122a, the fifth housing 122b and the sixth housing 122c. Further, there may be no separate housings 122,

material treatment system 110 first, followed by the second material treatment system 120. However, in alternative embodiments, the chemical liquid manufacturing apparatus 10 may also be configured to have the second material treatment system 120 positioned upstream of the first material treatment system 110 so that the processing target passes through or is processed by the second material treatment system 120 first, followed by first material treatment system 110.

[0066] In certain embodiments, the first material treatment system 110 is configured for an in-line single pass. More particularly, in the situation at which the chemical liquid manufacturing apparatus 10 is configured to have the first material treatment system 110 positioned upstream of the second material treatment system 120, the processing target is processed by or passes through the first material treatment system 110 once, and is discharged into the collection tank 130 before proceeding to the second material treatment system 120 or is conveyed to the second material treatment system 120 directly bypassing the collection tank 130. According to certain exemplary embodiments of the disclosure, for an in-line single pass, the first material treatment system 110 includes one unit of the filtration medium 114 selected from the first filtration medium 114a, the second filtration medium 114b, the third filtration medium 114c, and any combination thereof. In other words, the first material treatment system 110, configured for a single in-line process, may include one unit of the first filtration medium 114a, one unit of the second filtration medium 114b, or one unit of the third filtration medium 114c; or one unit of the first filtration medium 114a and one unit of the

second filtration medium 114b; or one unit of the first filtration medium 114a and one unit of the third filtration medium 114c; or one unit of the second filtration medium 114b and one unit of the third filtration medium 114c; or one unit of the first filtration medium 114a, one unit of the second filtration medium 114b, and one unit of the third filtration medium 114c. The first material treatment system 110 is configured to have the processing target to pass through and be processed by the one unit of the filtration medium 114 selected from the first filtration medium 114a, the second filtration medium 114b, the third filtration medium 114c, and any combination thereof, before delivering the processing target to the second material treatment system 120.

[0067] However, the present disclosure is not limited as such. In alternative embodiments, the first material treatment system 110 may also be configured for a recirculation of plural passes. It is noted that the number of times the processing target to be processed by the first material treatment system 110 is not limited, as long as the processing by the first material treatment system 110 is completed before the processing target is delivered to the second material treatment system 120 or the next stage of processing. In some exemplary embodiments, the first material treatment system 110 is configured for recirculation and to process the processing target for more than one time. If first material treatment system 110 is configured for recirculation to process the processing target more than once, for example twice, the first material treatment system 110 may include two units of filtration medium 114 selected from the first filtration medium 114a, the second filtration medium 114b, the third filtration medium 114c, and any combination

thereof. In other words, the first material treatment system 110 may include two units of the first filtration medium 114a, two units of the second filtration medium 114b, or two unit of the third filtration medium 114c; or two units of the first filtration medium 114a and two units of the second filtration medium 114b; or two units of the first filtration medium 114a and two units of the third filtration medium 114c; or two units of the second filtration medium 114b and two units of the third filtration medium 114c; or two units of the first filtration medium 114a, two units of the second filtration medium 114b, and two unit of the third filtration medium 114c. The first material treatment system 110 is configured to have the processing target to pass through one of the two units of the filtration medium 114 selected from the first filtration medium 114a, the second filtration medium 114b, the third filtration medium 114c, and any combination thereof, then recirculate to pass through another unit of filtration medium 114 selected from the first filtration medium 114a, the second filtration medium 114b, the third filtration medium 114c and any combination thereof, and subsequently proceed to the second material treatment system 120 or the next stage of processing. In addition, the recirculation operated by the first material treatment system 110 may be continuous and controlled by, for example, a CPU (central processing unit). However, in some alternative embodiments, the first material treatment system 110 may be configured to recirculate through the same one unit of the filtration medium 114 (114a, 114b, 114c, or any combination thereof).

[0068] In accordance to the embodiments of the chemical liquid manufacturing apparatus as shown in Figure 1, the second material treatment system 120 is

processing target as exemplified above are for illustrative purposes and are not intended to be limiting.

[0077] Moreover, in alternative embodiments, the first material treatment system 110 may include an additional filtration medium or material treatment module that is different, in terms of the type of treatment and functionality, from the first filtration medium 114a, the second filtration medium 114b, or the third filtration medium 114c; similarly, the second material treatment system 120 may include additional filtration medium that is different, in terms of the type of treatment and functionality, from the fourth filtration medium 124a, the fifth filtration medium 124b or the sixth filtration medium124c. Moreover, the additional filtration medium in the first material treatment system 110 or the second material treatment system may be accommodated in a housing. If the filtration medium 114 (114a, 114b, 114c) includes, for example, a particle removal filter, an ion-exchange membrane or an ion adsorption membrane, the additional filtration medium that is different from the first filtration medium 114a, the second filtration medium 114b, or the third filtration medium 114c may include an organic impurity absorption filter for organic impurities removal, or a dehydration membrane, water absorbent, an aeration replacement device, or a heating device for moisture removal. Similarly, if the filtration medium 124 (124a, 124b, 124c) includes, for example, a particle removal filter, an ion-exchange membrane or an ion adsorption membrane, the additional filtration medium that is different, in terms of treatment and functionality, from the fourth filtration medium 124a, the fifth filtration medium 124b, or the sixth filtration medium 124c may include an

more to about 1.0 μm (1000nm) or less. In a case where fine particles are provided in the processing target in addition to colloidalized impurities including metal atoms such as iron or aluminum, the processing target is filtered by using a filter having an average pore size as small as 50 nm to remove particles before filtering is performed by using a filter having average pore size as small as 20 nm or 15 nm to remove finer particles. Thus, the filtration efficiency is improved and performance of removing particles is more improved.

[0082] In some embodiments of the disclosure, the second filtration system (second material treatment system120) may include a particle removal filter having a pore size as small as 0.001μm (1nm), and may range from about 0.001μm (1nm) or more to about 0.015μm (15nm) or less. In certain embodiments, the second filtration system (second material treatment system 120) may include a UPE filter having a pore size as small as 3nm. Yet in other embodiments, the second filtration system (second material treatment system 120) may include a Nylon or a MPTFE filter having a pore size of about 5nm. Here, the average pore size can refer to the nominal value of the filter manufacturer.

[0083] Examples of the material of the filter used in particle removal include a fluororesin such as polytetrafluoroethylene (PTFE), a polyamide resin such as nylon and the like, a polyolefin resin (including high density and ultrahigh molecular weight) such as polyethylene and polypropylene (PP) and the like, a perfluoroalkoxy (PFA) resin and the like, or a modified polytetrafluoroethylene (MPTFE). In view of efficiently removing fine foreign matters such as impurities and/or aggregates contained in a chemical liquid, the filter used in particle removal of the present disclosure is made of at least one selected from the group consisting

and/or construction material. The second material treatment system 120 includes one or plural second filtration media 124; and when the second material treatment system 120 includes plural second filtration media 124, at least two of second filtration media 124 are different in functionality, pore size and/or construction material. The method for manufacturing a chemical liquid also includes delivering a processing target to the first material treatment system 110; processing the processing target by the one or plural first filtration media 114 in the first material treatment system 110 for one time; optionally recirculating the processing target through and be processed by the first material treatment 110 system again. The manufacturing method also includes delivering the processing target to the second material treatment system 120; processing the processing target by the one or plural second filtration media 124 in the second material treatment system 120; recirculating the processing target so that the processing target is processed by the second material treatment 120 system for at least two times. The manufacturing method further includes collecting a sample of the chemical liquid by a sample detector 150, for example, in-situ by an in-line particle counter 150, at the end of each processing of the second material treatment system 120, and measuring the number of particles and the content of metallic impurities remained in the chemical liquid. If the number of particles and the amount of metallic impurities detected in the sample are above the desired predetermined ranges, the chemical liquid is caused to be recirculated and processed by the second material treatment system 120 again. As soon as the sample detected by the particle counter 150 to have the number of particles and the amount of metallic impurities secured within the

CLAIMS

1. A chemical liquid manufacturing apparatus, comprising:

a first system configured to process a material, the first system comprising at least one first filtration medium, selected from a first filter, a first ion exchange membrane and a first ion adsorption membrane, wherein the first system is configured to process the material of at least one time; and

a second system configured to process the material, the second system comprising at least one second filtration medium, selected from a second filter, a second ion exchange membrane and a second ion adsorption membrane, wherein the second system is configured for a recirculation and to process the material of at least two times.

2. The chemical liquid manufacturing apparatus of claim 1, wherein the first system is positioned at an upstream side of the second system, and the material is processed by the first system before being processed by the second system.

3. The chemical liquid manufacturing apparatus of claim 1, wherein the first system is configured for a single pass.

4. The chemical liquid manufacturing apparatus of claim 1, wherein the at least one second filtration medium comprises the second filter, and the second filter is a pure sieving filter having a pore size of the second filter being about 10nm or less.

5. The chemical liquid manufacturing apparatus of claim 1, wherein the at least one first filtration medium comprises the first filter, and a pore size of the first filter is about 50nm or more.

6. The chemical liquid manufacturing apparatus of claim 1, wherein the at least one first filtration medium comprises the first filter, and a pore size of the first filter is about 15nm or more.

7. The chemical liquid manufacturing apparatus of claim 1 comprising the first ion exchange membrane or the first ion adsorption membrane.

8. The chemical liquid manufacturing apparatus of claim 1 further comprising an online particle counter.

9. A chemical liquid manufacturing apparatus for processing a material, comprising:

a first system comprising at least one first filtration medium, selected from at least one first filter, a first ion exchange membrane and a first ion adsorption membrane, wherein the first system is configured to process the material of at least one time; and

a second system comprising at least one second filtration medium, selected form at least one second filter, a second ion exchange membrane and a second ion adsorption membrane, wherein the second system is configured for a recirculation and to process the material of at least two times.

10. The chemical liquid manufacturing apparatus of claim 9, wherein the at least one first filter comprises two first filters, and the two first filters have different properties.

11. The chemical liquid manufacturing apparatus of claim 10, wherein the two first filters are different in at least one of a pore size and a construction material.

12. The chemical liquid manufacturing apparatus of claim 11, wherein one of the two first filters has a pore size of about 50nm or more.

13. The chemical liquid manufacturing apparatus of claim 11, wherein one of the two first filters has a pore size of about 10nm or less.

14. The chemical liquid manufacturing apparatus of claim 9, wherein the at least one second filter comprises two second filters, and the two second filters have different properties.

15. The chemical liquid manufacturing apparatus of claim 14, wherein the two second filters are different in at least one of a pore size and a construction material.

16. The chemical liquid manufacturing apparatus of claim 14, wherein at least one of the two second filters is a pure sieving filter having a pore size of about 10nm or less.

17. The chemical liquid manufacturing apparatus of claim 9, wherein the first system is positioned at an upstream side of the second system.

18. The chemical liquid manufacturing apparatus of claim 9, wherein the first system is configured for a single pass.

19. The chemical liquid manufacturing apparatus of claim 9 comprising the first ion exchange membrane or the first ion adsorption membrane.

20. A chemical liquid manufacturing apparatus, comprising:

a first system comprising one or plural first purification media, and when the first system comprising the plural first purification media, at least two of the plural first purification media being different in function, pore size or material; and

a second system comprising one or plural second purification media, and when the second system comprising the plural second purification media, at least two of the plural second purification media being different in function, pore size or material,

wherein the first system is configured for processing a material of at least one time and the second system is configured for a recirculation and to process the material of at least two times.

21. The chemical liquid manufacturing apparatus according to claim 20, wherein the one or plural first purification media is selected from a filter, an ion exchange membrane and an ion adsorption membrane.

22. The chemical liquid manufacturing apparatus according to claim 20, wherein the one or plural second purification media is selected from a filter, an ion exchange membrane and an ion adsorption membrane.