EDX (energy dispersive x-ray) for providing the elemental information. Any particle, which was found to produce any metal signal, was counted as a metal particle. The total number of particles with a metal signature was totalized to report as OWMP (on-wafer metal particle).

General Description of Total Trace Metal Measurement

The total trace metal concentration in each solvent sample was tested using ICP-MS (inductively coupled plasma mass spectrometry (ICP-MS). Using a Fujifilm developed method, each sample was tested for the presence of 26 metal species, the detection limit was metal specific, but the typical detection limits were in the range of 0.00010 - 0.030 ppb. The concentration of each metal species was then totalized to produce the value shown as total trace metal (ppb).

Example 1

Cyclohexanone was the solvent purified in this example. Referring to Figure 1, cyclohexanone was purified by using the following four purification systems (i.e., Systems 1-4), each of which included first and second filtration systems 110 and 120. In all of Systems 1-4, first filtration system 110 included a 200 nm polypropylene filter as filter 112a, an ion exchange filter as filter 112b, and a 20 nm nylon filter as filter 112c, but did not include any re-circulation loop. The differences among Systems 1-4 are as follows.

In System 1, second filtration system 120 included a 5 nm nylon filter (i.e., a filter having a plurality of filtration media made from nylon and having an average pore size of 5 nm) as filter 122a and a 3 nm PE filter (i.e., a filter having a plurality of filtration media made from polyethylene and having an average pore size of 3 nm) as filter 122b in a recirculation loop, but did not include any PTFE lined equipment or temperature control unit to control the temperature of the solvent.

As shown in Table 1, the cyclohexanone purified by System 1 exhibited relatively high on-wafer particle count, total on-wafer metal count, on-wafer iron count, and total trace metal count. Surprisingly, the cyclohexanone purified by System 2, 3, or 4 exhibited significantly lower on-wafer particle count, total on-wafer metal count, on-wafer iron count, and total trace metal count than the cyclohexanone purified by System 1.

Example 2

Ethyl lactate was purified by using Systems 5-7. System 5 was the same as System 1 described in Example 1 except that second filtration system 120 includes only one 5 nm nylon filter. System 6 was the same as System 2 described in Example 1. System 7 was the same as System 3 described in Example 1.

The properties (including on-wafer particle count, total on-wafer metal count, on-wafer iron count, on-wafer nickel count, and total trace metal count) of the ethyl lactate purified by Systems 5-7 were evaluated and summarized in Table 2 below.

Table 2

Ethyl Lactate	System 5	System 6	System 7
On-wafer particle count	1949	350	175
On-wafer metals count (all)	237	30	10
On-wafer metal count (Fe only)	35	5	3
On-wafer metal count (Ni only)	11	0	1
Total TM count	0.7	0.4	0.13

As shown in Table 2, the ethyl lactate purified by System 5 exhibited relatively high on-wafer particle count, total on-wafer metal count, on-wafer iron count, on-wafer nickel count, and total trace metal count. Surprisingly, the ethyl lactate purified by System 6 or 7 exhibited significantly lower on-wafer particle count, total on-wafer metal count, on-wafer iron count, on-wafer nickel count, and total trace metal count than the ethyl lactate purified by System 5.

CLAIMS

1. A method of purifying an organic solvent, comprising:

passing an organic solvent through a first filter to a packaging station in a purification system to obtain a purified organic solvent, the first filter comprising a filter housing and at least one filtration medium within the filter housing, and the at least one filtration medium having an average pore size of at most about 5 nm;

wherein the purification system comprises the first filter, the packaging station, and a conduit in fluid communication with the first filter and the packaging station, and the inner surface of the conduit or the filter housing comprises a fluoropolymer.

2. The method of claim 1, further comprising passing the organic solvent through a second filter in fluid communication with and between the first filter and packaging station, wherein the second filter comprises a filter housing and at least one filtration medium within the filter housing, and the at least one filtration medium in the second filter has an average pore size of at most about 5 nm.

3. The method of claim 2, wherein the at least one filtration medium in the first or second filter comprises a polyamide, a polyolefin, a fluoropolymer, or a copolymer thereof.

4. The method of claim 2, wherein the at least one filtration medium in the first or second filter comprises a nylon, a polyethylene, a polytetrafluoroethylene, or a copolymer thereof.

5. The method of claim 2, wherein the at least one filtration medium in the first filter comprises a nylon.

6. The method of claim 2, wherein the at least one filtration medium in the second filter comprises a polytetrafluoroethylene.

7. The method of claim 2, wherein the inner surface of the filter housing of the second filter comprises a fluoropolymer.

8. The method of claim 7, wherein the fluoropolymer in the inner surface of the first filter, the second filter, or the conduit comprises a polytetrafluoroethylene or a copolymer thereof.

9. The method of claim 2, wherein the entire second filter is made of a fluoropolymer.

10. The method of claim 2, wherein the first filter comprises 1 to 120 filtration media, and the second filter comprises 1 to 30 filtration media.

11. The method of claim 1, wherein passing the organic solvent through the first filter to the packaging station is performed at a temperature of at most about 80°F, or wherein the method further comprises passing the organic solvent through a heat exchanger to maintain the temperature of the organic solvent at most about 80°F.

12. The method of claim 1, further comprising passing the organic solvent through a third filter before passing the organic solvent through the first filter, wherein the third filter comprises at least one filtration medium that has an average pore size of at most about 200 nm.

13. The method of claim 12, further comprising passing the organic solvent through a fourth filter after passing the organic solvent through the third filter but before passing the organic solvent through the first filter, wherein the fourth filter comprises at least one ion exchange filtration medium.

14. The method of claim 13, further comprising passing the organic solvent through a fifth filter after passing the organic solvent through the fourth filter but before

passing the organic solvent through the first filter, wherein the fifth filter comprises at least one filtration medium that has an average pore size of at most about 20 nm.

15. The method of claim 1, further comprising circulating the organic solvent through a recirculation loop comprising the first filter at least two times before passing the organic solvent to the packaging station.

16. The method of claim 1, wherein the organic solvent comprises cyclohexanone, ethyl lactate, n-butyl acetate, propylene glycol monomethyl ether, propylene glycol monomethyl ether acetate, 4-methyl-2-pentanol, or propylene carbonate.

17. A method of purifying an organic solvent, comprising:

passing an organic solvent through first and second filters to obtain a purified organic solvent;

wherein the first filter comprises at least one filtration medium that has an average pore size of at most about 5 nm and comprises a polyamide, and the second filter comprises at least one filtration medium that has an average pore size of at most about 5 nm and comprises a fluoropolymer.

18. The method of claim 17, wherein the polyamide comprises a nylon and the fluoropolymer comprises a polytetrafluoroethylene.

19. The method of claim 17, wherein the entire second filter is made of the fluoropolymer.

20. The method of claim 17, wherein the first filter comprises 1 to 120 filtration media and the at second filter comprises 1 to 30 second filtration media.

21. The method of claim 17, wherein passing the organic solvent is performed at a temperature of at most about 80°F or wherein the method further comprises

passing the organic solvent through a heat exchanger to maintain the organic solvent to the temperature of at most about 80°F.

22. The method of claim 17, wherein the first filter comprises a filter housing and at least one filtration medium within the filter housing, the second filter comprises a filter housing and at least one filtration medium within the filter housing, and the inner surface of the filter housing of the first or second filter comprises a fluoropolymer.

23. The method of claim 17, wherein the first and second filters are in a purification system; the purification system further comprises a packaging station, and a conduit in fluid communication with the first filter, the second filter, and the packaging station; and the inner surface of the conduit comprises a fluoropolymer.

24. The method of claim 17, further comprising passing the organic solvent through a third filter before passing the organic solvent through the first and second filters, wherein the third filter comprises at least one filtration medium that has an average pore size of at most about 200 nm.

25. The method of claim 24, further comprising passing the organic solvent through a fourth filter after passing the organic solvent through the third filter but before passing the organic solvent through the first and second filters, wherein the fourth filter comprises at least one ion exchange filtration medium.

26. The method of claim 25, further comprising passing the organic solvent through a fifth filter after passing the organic solvent through the fourth filter but before passing the organic solvent through the first and second filters, wherein the fifth filter comprises at least one filtration medium that has an average pore size of at most about 20 nm.

27. The method of claim 17, further comprising circulating the organic solvent through a recirculation loop comprising the first and second filters at least two times before passing the organic solvent to a packaging station.

28. The method of claim 17, wherein the organic solvent comprises cyclohexanone, ethyl lactate, n-butyl acetate, propylene glycol monomethyl ether, propylene glycol monomethyl ether acetate, 4-methyl-2-pentanol, or propylene carbonate.

29. A system, comprising:

a first filter, wherein the first filter comprises a filter housing and at least one filtration medium within the filter housing, and the at least one filtration medium has an average pore size of at most about 5 nm;

a packaging station; and

a conduit in fluid communication with the first filter and the packaging station;

wherein the inner surfaces of the filter housing and the conduit comprise a fluoropolymer.

30. A system, comprising:

a first filter, the first filter comprising a filter housing and at least one filtration medium within the filter housing, wherein the at least one filtration medium has an average pore size of at most about 5 nm and comprises a polyamide; and

a second filter in fluid communication with the first filter, the second filter comprising a filter housing and at least one filtration medium within the filter housing, wherein the at least one filtration medium has an average pore size of at most about 5 nm and comprises a fluoropolymer.