Claims

We claim:

1. A particle collection device, comprising:

a vessel defining a chamber, wherein the vessel includes a distal end and a proximal end;

an inlet port extending from the proximal end of the vessel, wherein the inlet port is in fluid communication with the chamber;

an outlet port extending from the proximal end of the vessel, wherein the outlet port is in fluid communication with the chamber, and wherein the outlet port includes a porous material positioned between the chamber and the outlet port;

a collection insert positioned substantially within the chamber;

a support frame positioned between an interior wall of the chamber and the collection insert to thereby support the collection insert within the chamber, wherein the support frame comprises a distal ring, a proximal ring, one or more support legs connecting the distal ring to the proximal ring, and a gasket positioned adjacent to the proximal ring; and

a removable lid positioned at the proximal end of the vessel, wherein the collection insert is configured to be positioned within the chamber of the vessel such that the top edge of the collection insert folds over the top of the support frame and is sealed between the gasket and the removable lid when the removable lid is in a closed position.

2. The particle collection device of claim 1, wherein the collection insert comprises a plastic bag.

3. The particle collection device of any one of claims 1 or 2, further comprising:

a sampling tube having a distal end and a proximal end, wherein the proximal end of the sampling tube extends from the proximal end of the vessel, and wherein the distal end of the sampling tube extends into the chamber.

4. The particle collection device of claim 1, wherein the gasket comprises a neoprene gasket.

5. The particle collection device of any one of claims 1-4, wherein the porous material is selected from the group consisting of a frit, a mesh, and a cloth.

6. The particle collection device of any one of claims 1-5, wherein the porous material comprises a sintered filter having a distal end and a proximal end, wherein the proximal end of the sintered filter extends from the proximal end of the vessel and is coupled to the outlet port, and wherein the distal end of the sintered filter extends into the chamber.

7. The particle collection device of any one of claims 1-6, wherein an outer diameter of the inlet port has a range from 12.7 mm to 101.6 mm, wherein an outer diameter of the outlet port has a range from 12.7 mm to 20.8 mm, wherein an outer diameter of the sampling tube has a range from 6.35 mm to 25.4 mm, and/or wherein an outer diameter of the vessel has a range from 152.4 mm to 914.4 mm.

8. The particle collection device of any one of claims 1-7, wherein the inlet port includes a coupling mechanism to connect an outlet of a particle filtration system to the inlet port.

9. The particle collection device of claim 8, wherein the coupling mechanism comprises one or more sanitary fittings.

10. The particle collection device of claim 8, wherein the coupling mechanism comprises one or more compression fittings.

11. A particle collection system, comprising:

one or more particle formation systems;

one or more particle filtration systems in communication with one or more particle formation systems; and

one or more particle collection devices of any one of claims 1-10 in communication with the one or more particle filtration systems.

12. The particle collection system of claim 11, wherein the one or more particle formation systems comprise one or more high pressure supercritical fluid (SCF) particle formation systems, and wherein the one or more high pressure SCF particle formation systems include:

a pressurizable precipitation chamber including a SCF inlet, a process fluid inlet, and a fluid outlet; and

a process fluid disperser to disperse process fluid into the precipitation chamber.

13. The particle collection system of any one of claims 11-12, wherein the one or more particle filtration systems comprise a tandem particle filtration system including at least one high pressure harvesting filter system and at least one low pressure collection device in tandem and downstream of the harvesting filter.

14. The particle collection system of claim 13, further comprising at least one of:

a) two particle harvesting filters, two particle collection filters and two collection devices; b) two particle harvesting filters, one particle collection filter and one or more collection devices; c) two particle harvesting filters, two particle collection filters and one or more collection devices; d) two particle harvesting filters, one particle collection filter and one or more collection devices; e) two tandem filter particle harvesting and collection devices arranged in parallel; f) two or more particle harvesting filters arranged in parallel, one particle collection filter and two or more collection devices arranged in parallel; g) two or more precipitation chambers; h) at least two tandem filter particle filtration systems; i) at least two collection devices; or j) a combination thereof.

15. A method for isolating particles, the method comprising:

providing a collection device of any one of claims 1-10;

receiving a plurality of particles through the inlet port of the particle collection device;
collecting the plurality of particles in the chamber of the vessel;
receiving a fluid through the inlet port; and
venting the fluid through the porous material and out of the outlet port.

16. The method of claim 15, further comprising:
removing the plurality of particles from the chamber of the vessel.

17. A non-transitory computer readable medium having stored thereon instructions, that when executed by one or more processors, causes the collection device of any one of claims 1-10 to:
receive a plurality of particles through the inlet port of the particle collection device;
collect the plurality of particles in the chamber of the vessel;
receive a gas through the inlet port; and
vent the gas through the porous material and out of the outlet port.