[0007] In view of these drawbacks, there is an unmet need for an improved way for preserving samples into a container during storage and transport.

Summary of the Invention

[0008] In one aspect, a carbon dioxide (CO2) snow-making kit for charging CO2 and generating CO2 snow block in-situ within a container, comprising: a container comprising an interior volume defined defined by an internal meshed conduit volume, and a snow chamber into which CO2 snow block is configured to be generated and stored, said interior volume further surrounded by multiple container walls; the internal meshed conduit volume configured to receive a meshed conduit, wherein the snow chamber at least partially surrounds the meshed conduit; said meshed conduit comprising porous openings sufficient for gas to pass through, but for the CO2 snow block to remain substantially within the snow chamber; and a CO2 snow charger operably or integrally connected to or penetrated through the meshed conduit, said CO2 snow charger configured to selectively direct CO2 fluid into the snow chamber, the snow charger further comprising one or more openings in fluid communication with the snow chamber, wherein the CO2 snow charger connects to or extends through the meshed conduit such that a nozzle of the CO2 snow charger is oriented towards the snow chamber; and wherein the container comprises an opening through which a portion of the CO2 snow charger extends, and through which gas can vent.

[0009] In a second aspect, a method for in-situ charging of carbon dioxide (CO2) snow block within a container, comprising the steps of: supplying CO2 fluid into a CO2 snow charger operably or integrally connected to a meshed conduit that is located within an interior of the container; selectively directing the CO2 fluid into a snow chamber, wherein the snow chamber at least partially surrounds the meshed conduit;

generating in-situ CO2 snow particles and gas in the snow chamber; and passing the gas through the meshed conduit; and venting gas through an opening of the container in which a portion of the CO2 snow charger extends.

[0010] In a third aspect, a method for assembling a carbon dioxide (CO2) snow charging system at a site for in-situ generation of CO2 snow block in a container, comprising: providing a liquid CO2 source; providing a container, the container further comprising an internal product volume and a snow chamber; providing a meshed conduit; inserting the meshed conduit into the container such that the snow chamber at least partially surrounds the meshed conduit; providing a CO2 snow charger; operably connecting or penetrating a first end of the CO2 snow charger to or through the meshed conduit such that a nozzle of the CO2 snow charger is oriented towards the snow chamber; configuring the CO2 snow charger to direct CO2 fluid into the snow chamber, but not the internal product volume; and operably connecting a second end of the CO2 snow charger to the CO2 source.

[0011] In a fourth aspect, a carbon dioxide (CO2) snow charger system adapted to produce CO2 snow block in a snow chamber, comprising: a meshed conduit, said meshed conduit comprising porous openings sufficient for CO2 off-gas to pass through the porous openings, but substantially block particles of the CO2 snow block, wherein the snow chamber at least partially surrounds the meshed conduit; and a CO2 snow charger operably or integrally connected to or penetrated through the meshed conduit, said CO2 snow charger

configured to selectively direct CO2 fluid into the snow chamber, wherein a nozzle of the CO2 snow charger is oriented towards an internal meshed conduit volume.

[0012] As disclosed, an apparatus configured for storing, preserving or transporting one or more items, comprising: a container characterized by an interior volume comprising a first region and a second region, wherein the first region is an internal product storage volume, and the second region is a snow chamber into which CO2 snow is stored, said container further comprising multiple insulated container walls at least partially surrounding the first region and the second region; a meshed conduit or a product holder located within the interior container volume; wherein substantially all of the CO2 snow is adapted to occupy the snow chamber, whereby said CO2 snow is confined within the snow chamber; the internal product storage volume separate and distinct from said snow chamber, the internal product storage volume adapted to receive one or more items for storage, preservation and/or transport.

[0013] As disclosed, a method for assembling a carbon dioxide (CO2) snow charging system at a site for in-situ generation of CO2 snow block in a container, comprising: providing a CO2 source; providing an insulated container with an opening, the container further comprising an interior volume defined into a first region and a second region, wherein the first region is an internal meshed conduit volume, and the second region is a snow chamber; providing a meshed conduit operably connected or integrally connected to the insulated container; providing a CO2 snow charger comprising a conduit network having an inlet opening to receive the CO2 source and a plurality of nozzles distributed along an edge of the conduit, said CO2 snow charger further comprising one or more exhaust openings for gas to exhaust therefrom; attaching the CO2 snow charger to the container; securing a top of the meshed conduit to the CO2 snow charger at the top opening of the container; and operably connecting

Claims

1. A carbon dioxide (CO2) snow-making kit for charging CO2 and generating CO2 snow block in-situ within a container, comprising:

a container comprising an interior volume defined by an internal meshed conduit volume, and a snow chamber into which CO2 snow block is configured to be generated and stored, said interior volume further surrounded by multiple container walls;

the internal meshed conduit volume configured to receive a meshed conduit, wherein the snow chamber at least partially surrounds the meshed conduit;

said meshed conduit comprising porous openings sufficient for gas to pass through, but for the CO2 snow block to remain substantially within the snow chamber; and

a CO2 snow charger operably or integrally connected to or penetrated through the meshed conduit, the CO2 snow charger configured to selectively direct CO2 fluid into the snow chamber, the snow charger further comprising one or more openings in fluid communication with the snow chamber, wherein the CO2 snow charger connects to or extends through the meshed conduit such that a nozzle of the CO2 snow charger is oriented towards the snow chamber; and

wherein the container comprises an opening through which a portion of the CO2 snow charger extends, and through which gas can vent.

2. The kit of claim 1, wherein the snow chamber solely occupies the internal meshed conduit volume.

3. The kit of claim 1, wherein the CO2 snow charger creates a sealed connection with the meshed conduit but an unsealed connection with the container.

4. The kit of claim 1, wherein the interior volume of the container comprises an internal product storage volume, said internal product storage being separate and distinct from the snow chamber.

5. A method for in-situ charging carbon dioxide (CO2) snow block within a container, comprising the steps of:

supplying CO2 fluid into a CO2 snow charger operably or integrally connected to a meshed conduit, said mesh conduit located within an interior of the container;

selectively directing the CO2 fluid into a snow chamber, wherein the snow chamber at least partially surrounds the meshed conduit;

generating in-situ CO2 snow particles and gas in the snow chamber;

passing the gas through the meshed conduit; and

venting gas through an opening of the container in which a portion of the CO2 snow charger extends.

6. The method of claim 5, further comprising the step of introducing the CO2 snow charger into an opening of the container without sealing the CO2 snow charger to the container.

7. The method of claim 5, further comprising packing the CO2 snow particles to form a substantially CO2 snow block.

8. The method of claim 5, further comprising accumulating the in-situ CO2 snow particles within the snow chamber without substantial migration or passage of the CO2 snow particles into an internal product storage volume.

9. The method of claim 5, further comprising generating information relating to the in-situ charging of CO2 snow particles, said information to be (i) incorporated into a unique identifier for the container; or (ii) transferred to a database.

10. A method for assembling a carbon dioxide (CO2) snow charging system at a site for in-situ generation of CO2 snow block in a container, comprising:

providing a CO2 source;

providing a container, the container further comprising an internal product volume and a snow chamber;

providing a meshed conduit;

inserting the meshed conduit into the container such that the snow chamber at least partially surrounds the meshed conduit;

providing a CO2 snow charger;

operably connecting or penetrating a first end of the CO2 snow charger to or through the meshed conduit such that a nozzle of the CO2 snow charger is oriented towards the snow chamber;

configuring the CO2 snow charger to direct CO2 fluid into the snow chamber, but not the internal product volume; and

operably connecting a second end of the CO2 snow charger to the CO2 source.

11. The method of claim 10, further comprising operably connecting the first end of the CO2 snow charger to the meshed conduit without creating a sealed connection to the container.

12. A carbon dioxide (CO2) snow charger system adapted to produce CO2 snow block in a snow chamber, comprising:

a meshed conduit, said meshed conduit comprising porous openings sufficient for CO2 off-gas to pass through the porous openings, but substantially block particles of the CO2 snow block, wherein the snow chamber at least partially surrounds the meshed conduit; and

a CO2 snow charger operably or integrally connected to or penetrated through the meshed conduit, said CO2 snow charger configured to selectively direct CO2 fluid into the snow chamber, wherein a nozzle of the CO2 snow charger is oriented towards an internal meshed conduit volume.

13. The snow charger system of claim 12, wherein a nozzle of the CO2 snow charger is oriented away from an internal meshed conduit volume.