CLAIMS

1. A process for freezing an organic product using a freezing device, the process comprising:

introducing the organic product inside a tank of the freezing device, wherein the tank contains a freezing solvent set at a predefined temperature, wherein the organic product is at a temperature higher than the predefined temperature, and wherein the freezing solvent is at least one of an alcohol based solution and an aqueous solution comprising at least one inhibitor;

passing nitrogen in a form of bubbles into the freezing solvent by using a gas permeable structure placed inside the tank, wherein nitrogen is provided to the gas permeable structure in one or more of a gaseous form, a liquid form, and a combination thereof through at least one inlet port of the tank, wherein a form of the nitrogen is selected based on the predefined temperature, and wherein the predefined temperature is selectable from −40 to −195 degree Celsius;

circulating the freezing solvent from the tank, through a liquid transmission means and back into the tank using a pump to maintain the freezing solvent at the predefined temperature, wherein the liquid transmission means and the pump are coupled externally to the freezing tank;

agitating the freezing solvent using at least one agitator placed within the tank; and

performing passing nitrogen, circulating the freezing solvent, and agitating the freezing solvent, until a core temperature of the organic product reaches the predefined temperature.

2. The process of claim 1, further comprising:

cooling the freezing solvent contained within the tank by at least one cooling unit coupled to the tank; and

passing nitrogen in one of a gaseous , a liquid form and a combination thereof through the at least one inlet port of the tank into the freezing solvent to bring the temperature of the freezing solvent to the predefined temperature, prior to introducing the organic product into the freezing tank.

3. The process of claim 1, wherein introducing the organic product inside the tank further comprises:

placing one or more samples of the organic product on an arrangement of shelves, wherein each sample on a shelf is spaced at a predefined distance from another sample on the shelf, wherein each shelf is provided with a plurality of holes to facilitate flow of the freezing solvent onto a sample placed on the each shelf; and

lowering the arrangement of shelves into the tank through the at least one access of the tank.

4. The process of claim 1, further comprising:

ceasing the passing nitrogen, circulating the freezing solvent, and agitating the freezing solvent when the core temperature reaches the predefined temperature; and

removing the organic product from the tank, upon ceasing the passing nitrogen, circulating the freezing solvent, and agitating the freezing solvent.

5. The process of claim 1, wherein the tank is a double walled tank insulated with a foam material.
6. The process of claim 1, wherein the freezing solvent is a dehydrated ethanol solution having a low surface tension.
7. The process of claim 1, wherein the at least one inhibitor is selected from a group of non-ionic surfactants, and antifreeze additives.
8. The process as claimed in claim 1, wherein the freezing solvent is an aqueous solution of ethanol, and wherein the at least one inhibitor is selected from a group consisting of Polysorbate 80, monoacyl glycerol, octyl glucoside, sodium chloride (NaCl), and calcium chloride (CaCl), and wherein a proportion of the ethanol to the at least inhibitor is 10:1.
9. The process of claim 1, wherein the predefined temperature of the organic product sample is selected based on a water and a fat content of the organic product.
10. The process of claim 1, wherein the gas permeable structure is selected from a group consisting of a bubble generator, a nano membrane, and a sparger based on a form of nitrogen provided through the at least one inlet port.
11. The process of claim 1, wherein the organic product is selected from the group consisting of fish, meat, vegetables, fruits, roots, seeds, microbes, fungi and blood plasma.

12. The process of claim 1, wherein the process further comprises a step of isolating the organic product from the freezing solvent by sealing the organic product in at least one of a gas permeable bag and a high barrier bag.
13. The process of claim 1, wherein the agitator is selected from the group consisting of fan, screw-type and helical agitators, wherein a speed of the agitator, is selected based on a viscosity of the freezing solvent, and wherein the speed is selected in a range of 1 to 500 rpm.
14. A freezing device to freeze an organic product, the freezing device comprising:

a tank having at least one access means through which the organic product is introduced into the tank, wherein the at least one access means is adapted to be opened for introducing the organic product, wherein the tank to contain a freezing solvent maintained at a predefined temperature, wherein the freezing solvent is at least one of an alcohol based solution, and an aqueous solution comprising at least one inhibitor;

at least one inlet of the tank to permit the freezing solvent to flow inside the tank;

at least one outlet of the tank to permit the freezing solvent to flow out of the tank;

at least one liquid transmission means coupled to a pump to circulate a stream of the freezing solvent between the at least one inlet and the at least one outlet; and

at least one agitator, suspended within the freezing solvent, and adapted to rotate for agitating the freezing solvent and breaking one or more layers of heat around the organic product.

a gas permeable structure placed inside the tank to pass nitrogen in a form of bubbles into the freezing solvent, wherein the gas permeable structure is coupled to at least one inlet port of the tank that receives nitrogen in one of a gaseous form and a liquid form, based on a temperature of the freezing solvent and the predefined temperature, wherein the at least one inlet port is connected to a reservoir containing nitrogen; and

a controller configured to:

control an opening of the at least one inlet port to facilitate a flow of nitrogen in the liquid form when the temperature of the freezing solvent and the predefined temperature is in a range of −160 to −195 degree Celsius; and

control the opening of the one or more inlet ports to facilitate the flow of nitrogen in the gaseous form, the liquid form and a combination thereof when the temperature of the freezing solvent and the predefined temperature is in a range of −40 to −160 degree Celsius.

15. The freezing device of claim 12, wherein the controller is further configured to:

operate the pump to circulate the freezing solvent from the at least one inlet, through the at least one liquid transmission means to the at least one outlet;

control an opening of the at least one inlet and the at least one outlet using one or more electromechanical valves provided within the at least one inlet and the at least one outlet to permit flow of the freezing solvent through the at least one inlet and the at least one outlet respectively;

control an opening of the at least one inlet port to facilitate a flow of nitrogen in one of a gaseous and a liquid form to the gas permeable structure, based on a temperature of the freezing solvent and the predefined temperature;

operate the at least one agitator at a predefined speed;

until a core temperature of each sample reaches the predefined temperature

16. The freezing device of claim 15, wherein the controller is configured to select the predefined speed based on a viscosity of the freezing solvent, and wherein the predefined speed is selected in a range of 1 to 500 rotations per minute (rpm).
17. The freezing device of claim 14, wherein the gas permeable structure is a sparger connected to an inlet port that provides nitrogen in the liquid form, and wherein the gas permeable structure is one of a bubble generator and a nano membrane connected to an inlet port that provides nitrogen in the gaseous form.
18. The freezing device of claim 14, further comprising:

an arrangement of shelves placed inside the tank for accommodating one or more samples of the organic product, wherein a spacing between one or more shelves is adjustable using an adjusting means based on a size of the one or more

samples, and wherein each shelf is provided with a plurality of holes to facilitate flow of the freezing solvent onto a sample placed on the each shelf.

19. The freezing device of claim 14, further comprising:

    a displaceable carriage arrangement comprising a plurality of carriages connected to each other using a metal wire, and a pair of rails for transferring the plurality of carriages in and out of the tank through the at least one access means, wherein each carriage comprises at least one shelf for accommodating one or more samples of the organic product, wherein the displaceable carriage arrangement contains the freezing solvent and is placed inside the tank.

20. The freezing device of claim 14, wherein the at least one agitator is selected from the group consisting of fan, screw-type and helical agitators.

21. The freezing device of claim 14, wherein the tank is a double walled tank comprising an inner wall and an outer wall, wherein an inner wall is surrounded with cooling coils adapted to circulate a refrigerant to maintain a space contained by the inner wall at the predefined temperature, wherein the freezing solvent is contained in the space, and wherein the double walled tank is insulated with a semi rigid foam material disposed between the inner wall and an outer wall.

22. The freezing device of claim 21, wherein the inner wall and the outer wall are made of at least one of a metallic material and a moldable material.

23. The freezing device of claim 14, wherein the at least one access means is a closeable opening provided at a top of the tank, wherein the at least one access means is adapted to be closed by sliding a sealable lid such as to cover the at least one access means completely, and wherein the at least one access means is adapted to be opened by sliding the sealable lid into an open position that exposes the inside of the tank through the access means.