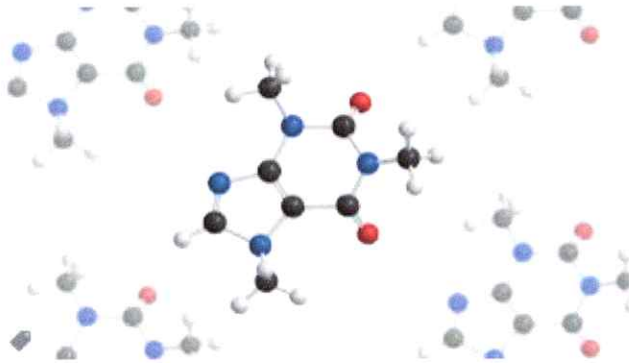


Molecular Gastronomy

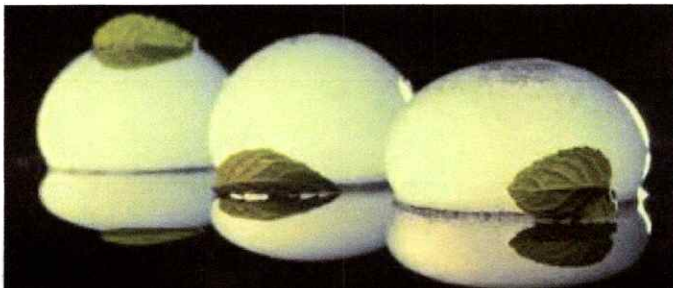
Chemistry of Cooking

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LOS ANGELES TRADE-TECH
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Liquid Nitrogen

Culinary use of liquid nitrogen

The culinary use of liquid nitrogen is mentioned in an 1890 recipe book titled *Fancy Ices* authored by Mrs. Agnes Marshall. She has been employed in more recent times by restaurants in the preparation of frozen desserts, such as ice cream, which can be created within moments at the table because of the speed at which it cools food. The rapidity of chilling also leads to the formation of smaller ice crystals, which provides the dessert with a smoother texture. The technique is employed by Chef Heston Blumenthal who has used it at his restaurant, The Fat Duck to create frozen dishes such as egg and bacon ice cream. Liquid nitrogen has also become popular in the preparation of cocktails because it can be used to quickly chill glasses or freeze ingredients. It is also added to drinks to create a smoky effect, which occurs as tiny droplets of the liquid nitrogen come into contact with the surrounding air, condensing the vapor that is naturally present.

Safety

Because the liquid-to-gas expansion ratio of nitrogen is 1:694 at 20 °C (68 °F), a tremendous amount of force can be generated if liquid nitrogen is rapidly vaporized in an enclosed space. In an incident on January 12, 2006 at Texas A&M University, the pressure-relief devices of a tank of liquid nitrogen were malfunctioning and later sealed. As a result of the subsequent pressure buildup, the tank failed catastrophically. The force of the explosion was sufficient to propel the tank through the ceiling immediately above it, shatter a reinforced concrete beam immediately below it, and blow the walls of the laboratory 0.1–0.2 m off their foundations.

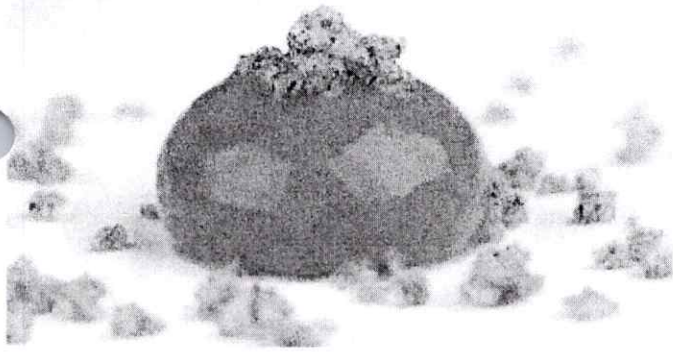
Because of its extremely low temperature, careless handling of liquid nitrogen and any objects cooled by it may result in cold burns. In that case, special gloves should be used while handling. However, a small splash or even pouring down skin will not burn immediately because of the Leidenfrost effect, the evaporating gas thermally insulates to some extent, like touching a hot element very briefly with a wet finger. If the liquid nitrogen manages to pool anywhere, it will burn severely.

As liquid nitrogen evaporates it reduces the oxygen concentration in the air and can act as an asphyxiant, especially in confined spaces. Nitrogen is odorless, colorless, and tasteless and may produce asphyxia without any sensation or prior warning.

Oxygen sensors are sometimes used as a safety precaution when working with liquid nitrogen to alert workers of gas spills into a confined space.

Vessels containing liquid nitrogen can condense oxygen from air. The liquid in such a vessel becomes increasingly enriched in oxygen (boiling point 90 K; -183 °C; -298 °F) as the nitrogen evaporates, and can cause violent oxidation of organic material.

Ingestion of liquid nitrogen can cause severe internal damage, due to freezing of the tissues which come in contact with it and to the volume of gaseous nitrogen evolved as the liquid is warmed by body heat. In 1997, a physics student demonstrating the Leidenfrost effect by holding liquid nitrogen in his mouth accidentally swallowed the substance, resulting in near-fatal injuries. This was apparently the first case in medical literature of liquid nitrogen ingestion. In 2012, a young woman in England had her stomach removed after ingesting a cocktail made with liquid nitrogen.



Spherification (Encapsulated liquid food)

- 300g Juice, Sauce, or other Flavored Puree
- 1g Powered Gelatin
- .75g Xanthan Gum
- 3.75g Calcium Gluconate

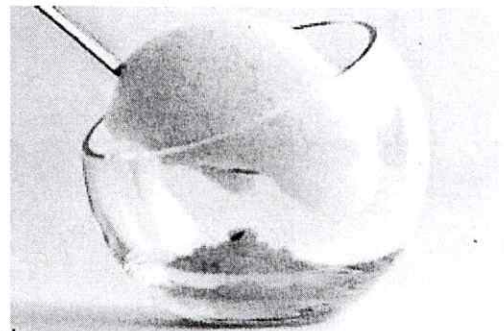
Water Bath to Set (Algen Bath)

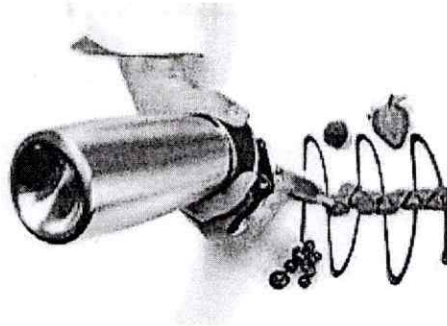
- 1000g Filtered Water (1L)
 - 5g Sodium Alginate
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- ⚡ Mix the calcium gluconate, gelatin, and xanthan with ½ of the juice, sauce or flavored puree and blend till completely dissolved.
 - ⚡ Mix in remaining juice, sauce or flavored puree, strain and allow sitting to remove any bubbles. 6-8 hours.
 - ⚡ Dissolve the sodium alginate in the filtered water. Let it hydrate for 1-2 hours.
 - ⚡ Carefully drop the juice, sauce or flavored puree mixture into the Algen bath and let set for 2-3 minutes.
 - ⚡ After the membrane is set carefully remove capsules from Algen bath and place in a bath of cool clear water to rinse off the excess algen
 - ⚡ Carefully remove drain and dry the capsules then serve immediately.

Air

- 250g Flavored liquid, Sweet, Savory
- 1.5g Lecithin

- ⚡ Mix lecithin with an immersion blender till fully incorporated.
- ⚡ Position Emersion Blender in order to incorporate the most air bubbles... near the surface of the liquid.
- ⚡ Air bubbles will catch in to top of the liquid.
- ⚡ Expel air into a serving container and spoon onto plate.
- ⚡ Note lecithin is a soy protein based product





Foam

- 16oz. (1pt) Juice, or other Flavored Puree
- .25g Guar Gum
- .5g Xanthan Gum
- 1.5g Methocel

Method 1:

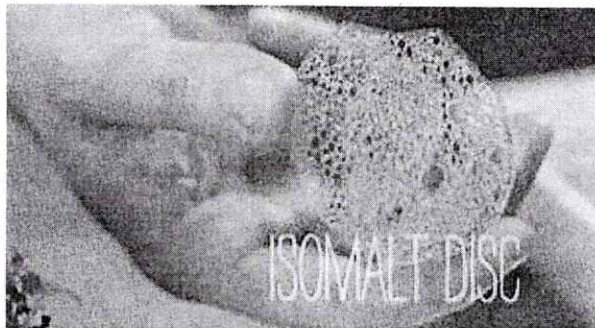
- ✚ Place juice or flavored puree in the stand mixer with whip attachment
- ✚ While the mixer is running, slowly dust in the Xanthan Gum and Guar gum. Then, dust in the Methocel.
- ✚ Let the mixer run for 15-20 minutes and serve.

Method 2:

- ✚ Mix Gum Powders and Methocel with Juice or puree with an immersion blender till fully incorporated
- ✚ Place contents into an isi canister $\frac{3}{4}$ full, charge with two NO2 chargers
- ✚ Expel foam into a serving container and spoon onto plate.

Edible Glass

25 Grams of Isomalt



- ✚ Sprinkle the Isomalt Crystals onto a Sylpat lined Sheet Pan
- ✚ Place another Sylpat on top of the Isomalt
- ✚ Place a second identical sheet pan on top of the first
- ✚ Bake at 350° F conventional oven for 25 minutes
- ✚ Allow the trays to cool for 30 minutes.
- ✚ Carefully remove the edible glass sheets and use as desired

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Nitro Chocolate Sorbet

Servings: Makes 1 quart

1/4 cups (555 ml) water

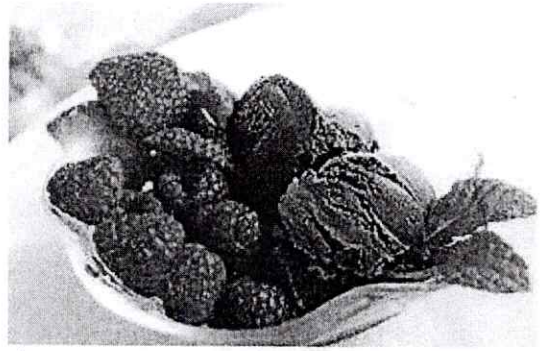
1 cup (200 g) sugar

3/4 cup (75 g) unsweetened Dutch-process cocoa powder

Pinch of salt

6 ounces (170 g) bittersweet or semisweet chocolate, finely chopped

1/2 teaspoon vanilla extract



- ✦ In a large saucepan (yes, you must use a large one or it will bubble over. Trust me.), whisk together 1 1/2 cups (375 ml) of the water with the sugar, cocoa powder, and salt. Bring to a boil, whisking frequently. Let it boil, continuing to whisk, for 45 seconds.
- ✦ Remove from the heat and stir in the chocolate until it's melted, then stir in the vanilla extract and the remaining 3/4 cup (180 ml) water. Transfer the mixture to a blender and blend for 15 seconds. Chill the mixture thoroughly, Using a Standup mixer and liquid nitrogen.

Reverse Spherification (Caviar)

- 9oz Juice or Puree
- 2g Sodium Alginate
- 18oz Filtered Water
- 2.5g Calcium Gluconate

- ✦ Mix the sodium alginate with 1/2 of the juice or puree and blend till completely dissolved. Mix in remaining juice, strain and allow sitting to remove any air bubbles. Dissolve the calcium gluconate in the water. Fill syringe or a squeeze bottle with the juice mixture. Softly expel mixture into calcium chloride bath drop by drop. After a minute, remove gently with a tea strainer and rise gently in cold water.

