Innovation gradient mousse material processing technology research

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Abstract. The purpose of this research is to investigate the properties of the gradient mousse multi-layer composite structure in terms of phase change and solidification of the material, and to optimize the crystallization characteristics of the material, from the upper soft layer to the lower solid roughening layer, through the material distorting intermediate binding layer to form a unique sandwich structure. This research will be based on material processing and transformation technology, layered curing, and finally observed by optical microscopy and surface elastic tension, etc. Ratio of the upper layer of soft material is preferred solid-liquid ratio of 1:10 to fusion emulsified soft upper layer. The optimal material ratio of the lower layer of solid roughening layer is 2:1. The final preliminary optimal results are obtained through material analysis. The spirit of this research can be extended to the discussion of food processing in the field of materials science and the research on the issues related to food processing safety.

1. Introduction
Mousse originated from a Mecca for gourmets France, Paris, In order to improve the structure of the cream and provide a stable function, the dessert masters added more than ten kinds of fresh accessories to the fresh cream, and through the control of the temperature, the proportion of the raw materials, and the grasp of the PH value, the brand-new mixture was born. In terms of appearance, color and taste, it is more natural, pure and rich in change than the original. They gave this dessert a nice name - mousse.

The appearance of mousse is consistent with people's pursuit of refined fashion, advocating a natural and healthy life philosophy and meeting people's constant demands for cakes. Mousse cakes also give the masters a greater creative space. The masters demonstrated their inner life savvy and artistic inspiration through the production of mousse cakes. At the World West Point World Cup,
competition of mousse cakes has always been fierce, and the standards reflect the real skills of the masters and the development trend of the world cake.

Because the mousse does not contain flour, it is not a cake or bread. It is a dessert of the type of milk jelly made of gelatin and cheese and salt-free butter. The production of mousse does not require baking. It is made from raw materials such as jelly and salt-free butter, so it needs to be stored at a low temperature [1].

In the production process, you can add different flavors according to your preferences. In this experiment, we selected the most extensive set of production methods. The easiest way to do this is to use a mixture of digestive biscuits (carbohydrate + soda + wheat, Digestive Biscuit, abbreviated as DB) and Salt-free butter (abbreviated as SFB) as the basal layer (DS) with a fixed foaming emulsifier. Foaming Emulsion (FE) FE is simply the thing that homogenizes water and oil. Since water and oil are two different polarities, they are generally immiscible, if not mixed together; the most convenient way for each other is to add a surfactant because the process of mixing oil and water is called emulsification. The structure of FE is mostly a linear molecule, with a hydrophilic polar group at one end and a lipophilic nonpolar group at the other end to obtain the optimal mousse sandwich structure ratio [2]. After DS+FE is processed through freezing, the crystal grains are still in a state of relatively high strain energy after the recovery period is judged with the degree of recrystallization, and the degree of recrystallization depends on the time and temperature. The degree of recrystallization (or recrystallization ratio) increases with time. Recrystallization is the formation of an unstrained and equiaxed lattice arrangement (i.e., the grains are roughly the same size in all directions). These grains have a lower density of discontinuities and at the same time have the characteristics that they had prior to cold working [3]. According to the experimental results, under the fixed mousse ratio, we will investigate whether the underlying changes will affect the underlying solid roughening layer (DB broken, D50, 0.6mm-1.2mm) and the upper soft layer (FE, foaming coefficient 30μm-50μm) a mixed layer (defined as a layer I) change in the intermediate layer, the material of the intermediate bonding layer disguised, such sandwich structures having a unique mousse cake. Does it affect the degree of binding of mousse and biscuits at different mixing ratios of biscuits and butter? Therefore, the purpose of the experiment is to explore two main directions: 1. Study the mixing and penetration of mixed layers at different ratios. 2. Solve and discuss ways to combine.

2. Principle

2.1. Experimental principle explanation

As shown in Figure 1 at first, DB is subjected to rough grinder and then through fine grinder makes it appear as a powdery. [4]. Digestion cake originated in Britain, In 1892, Alexander Grant helped people digest and invent the world's first digestive biscuits. McVitie's digestive biscuit, Chinese translated as "McVitie's digestive biscuits". After the phase change, the phase-transformed milk SFB is mixed with fine powder, frozen, mixed into fine powder and frozen. The DB contain (Protein: 3g, Fat: 10.5g, Carbohydrate: 33g, Sugars: 9g) Total Mass: 55.5g; Scale: Protein: Fat: Carbohydrate: Sugars.5.41%: 18.91%: 59.46%: 16.22%

As shown as Figure 2 when the SFB is heat-treated and softened, it is added to the ground DB fine powder to produce a solid solution. The fine powder mixes to produce a solid solution [5].

Whipping cream foaming, when holding the blender in the same direction, when holding the blender in the same direction for about 10 to 15 minutes, the fine foam will be more and more, and the fine foam will be more and more until the whole becomes white as fresh cream [6]. A creamy, creamy, thick, thick mass that causes the cream to grow to its original volume and the cream will grow to about 50 times its original volume become a thick fluid texture material and a angle of repose >90 [7]. This stage is called wet foaming, and it is even and detailed, smooth and stable. At this time, it means uniform, meticulous, smooth and stable state. In this case, the foaming is completed, and in order to add flavor and tightness to the mouth, to increase its flavor and tightness, it is also possible to add
other dairy products such as a sensation to add flavor and a dense mouthfeel. For example, another dairy product such as cheese can be added [8].

Figure 1. Schematic Diagram of DB.

Figure 2. Schematic Diagram of SFB.

Figure 3. FE.

DB and FE at the optimal ratio will be due to gelation of giglidin, when FE penetrates (Figure 3) into the DB layer at low temperature, the phenomenon is called mixed layer (I layer Figure 4). It also forms a unique sandwich structure. As shown in the Table 1. The lowest energy objective lens was used to focus the sample according to OM Canon + Olympus1. Turn the power objective into position. If necessary, the coarse height controller reduces the sample to make room, the table height controller lowers the sample to make room, the table height controller lowers the sample to make room, and the table height controller lowers the sample to make room. The stage height controller lowers the sample
to make room, the table height controller lowers the sample to make room, the table height controller lowers the sample to make room, the table height controller lowers the sample to make room, the table height controller reduces Samples to make room, bench height controllers to reduce samples to make room, bench height controllers to reduce samples to make room, and bench height controllers to reduce samples to make room. The table height controller lowers the sample to make room, the table height controller lowers the sample to make room, and the table height controller lowers the sample to make room to convert the objective lens into place. 2. Turn the stage height focus controller to place the sample about half a centimeter under the objective lens. 3. Look through the eyepiece and use the focus controller to place the sample at the appropriate point. 4. Scan the sample surface by using the stage position controls to move and select areas that may require more comprehensive investigation at higher magnifications. 5. Convert the high power objective into position. 6. Use a fine controller to adjust the height of the stage until the sample is in focus. The objective lens cannot contact the sample surface anytime [9].

![Figure 4](image.png)

**Figure 4.** Schematic of I layer.

3. **Experimental Analysis and Discussion**

The DB was roughly ground before it was ground to a pellet size (Figure 1) and finely ground to pulverize it (Figure 2). When SFB is stored at low temperature as γ phase, the dynamic behavior of its heat treatment is transformed into η phase through temperature increase, and homogenous nucleation changes in metamorphism make mixed DB fine powder can achieve homogeneous solid solution. The FE, at 250 - 300 rpm stirring, instantaneously stretches, breaks, and coats the air from the alpha-rich, highly fluid, thick mass to form a white, multi-pore, thick mass in the beta state. This material forms a non-flowing, delicate, elastic structure. The foamed composite material was obtained by mixing C₆H₁₂O₆ refinement crystals and β-phase foaming layers in a ratio of 1:3 according to the secondary crystallization [10]. At different ratios, DB and SF will cause different penetration and degree of incorporation of the mixed layer (I layer) with a fixed ratio of FE.
3.1. Mixed Layer (I Layer) Discussion

According to the experimental proportion of different observations of the penetration and the degree of bonding is significantly different, from the data (Table 1-a) 20-5% phenomenon can be seen as the underlying DB and SFB in a fixed ratio of FE penetration is not complete. Due to the lack of coating and lubricity of SFB, FE bonding is incomplete; The SFB partially coating of DB (Table 1-b) 20-10% of the phenomenon shows that the degree of penetration reaches an average state, and FE emulsified substances in the DB level has been difficult to determine its layered interface; (Table 1-c) 20-12.5% This phenomenon can be seen that the microscopic and more obvious layered interface between the DB layer and the FE layer, and the penetration of the FE emulsified substance is caused by the phenomenon of oil-water separation due to the higher SFB content than its equilibrium value (Table 1-d). Phenomenon indicates that the I layer interface has been separated, due to the excessive SFB (Table 1-c) 12.5% and (d) above the differential row sliding. The phenomenon in layer I shows that the surface tension caused by the excessive oiliness of SFB causes repulsion of its FE material, causing the phenomenon of poor sliding of the layer I. As can be seen in Table (1-C), Table (1-D), if the added SFB exceeds the fat solubility of DB, it will be heterogeneously separated by surface tension under the condition of its FE support. The infiltration of FE is incomplete and stratified (Table 1-d), and when the amount of SFB added does not reach the phase balance of DB fat-soluble, it will cause cracking of the DB layer.

Table 1. DB Layer, FE Layer, and I Layer Shot with OM Canon + Olympus 5x.

| Phenomenon | Image |
|------------|-------|
| (a)20-05   | ![Image](a20-05.jpg) |
| (b)20-10   | ![Image](b20-10.jpg) |
| (c)20-12.5 | ![Image](c20-12.5.jpg) |
| (d)20-15   | ![Image](d20-15.jpg) |

4. Conclusions

In this experiment, we can find that:

1. In the grinding process, the finer the granules after grinding, the larger the coating of SFB, and the more intensive penetration of the FE material at the optimal ratio after the experiment.
2. In the experiment, according to the experimental proportion of the DB layer, it was observed that the I layer
   1. According to the ratio of 2:1, the best proportion is known. Under this data, it can be seen that the degree of integration is closer and the average penetration, and the I layer interface is nearly disappearing, and it is difficult to judge the interface I layer.
II. At a ratio greater than 8:5, excessive SFB will affect the degree of penetration of FE materials, and because the fat-soluble phase balance of DB is exceeded, the separation of oil and water is similar to FE material due to the surface tension strength of SFB.

III. In the range of less than 4:1 ratio, due to too small amount of SFB, the degree of fat solubility of DB is not complete enough, and the coverage of DB with DBB by SFB only partially causes cracking of DB layer when used as the bottom layer, and its upper FE material will also become incomplete because of lack of lubrication of SFB.

In this study, experimental observation of the structural layer, to explore the process of change from the point of view of food materials science, According to the above conclusions, a comprehensive explanation is given that the oil in the mixed layer is too much or too little, Embedded into the material such that the different layers have mixed good adhesion, but also scientific thinking among base material, And thus cross-cutting research to explore the best combination of ingredients.

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