APPENDIX A

Preparation of tofu powder, pre-emulsion and the emulsion gel

A1 Tofu powder preparation (Panyathitipong and Puechkamut, 2002)

Soybean was soaked in water (soybean : water = 1:3) at 5°C for 3 hrs. The soaked beans were drained and ground in the grinder with boiled water at 80°C and 0.1% $CaCO_3$ corresponded to the water to raw bean ratio of 5:1 for extracting solids from soybean into raw soymilk. The soymilk was heated to 80°C and mixed with coagulant (2.2% $MgSO_4$) held for 15 min to coagulate. Bean curd was centrifuged to remove whey for 5 min. Tofu was dried in a tray dryer for 5 hrs. at 70°C and ground by pin mill into powder to pass through a 0.25 mm sieve size.

A2 Pre-emulsion and the emulsion gel preparation (Modified method from Chotipratoom, 2003)

Tofu powder was prepared to be pre-emulsion for replacing surimi in surimi emulsion gel process. Pre-emulsion was made by mixing tofu powder with water and oil. Water was added to adjust the moisture content of tofu powder to surimi and the amount of oil was equal the added oil of the formulation.

Frozen surimi was ground in commercial food processor for 1 min at low speed with salt, 50% of ice and pre-emulsion. Sugar was slowly added and the left with 50% of ice was incorporated for 2 min at high speed. The batter was stuffed in a stainless mold and heated in a temperature controlled water bath maintained at 40°C for 20 min and 90°C for 20 min. Then, samples were cooled immediately in cool water.

A3. Formulation of surimi emulsion gel with tofu powder at various concentrations

Table A1 The basic formulation of surimi emulsion gel with tofu powder at various concentrations

Ingredients	Treatment				
(%w/w)	0%	20%	40%	60%	80%
Surimi	60.58	44.67	31.08	19.32	9.05
Tofu powder	-	11.17	20.72	28.98	36.19
Water	-	7.82	14.50	20.28	25.33
Soybean oil	7.69	7.09	6.58	6.13	5.74
Ice	27.26	25.13	23.31	21.73	20.36
Sugar	3.03	2.79	2.59	2.41	2.26
Salt	1.44	1.33	1.23	1.15	1.07

A4. Formulation of surimi tofu emulsion gel

Table A2 The basic formulation of surimi tofu emulsion gel

Ingredients	Content (%w/w)
Surimi	31.50
Tofu powder	21.00
Ice	23.50
Water	20.00
Sugar	2.50
Salt	1.25
Flavor enhancer	0.25

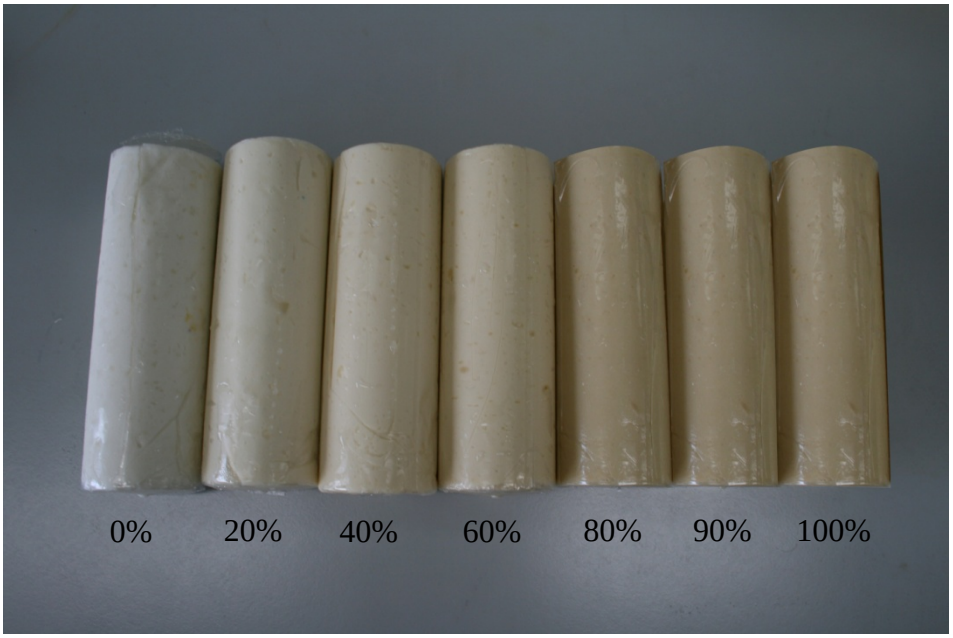


Figure A1 The characteristic of surimi emulsion gel with tofu powder at various concentrations

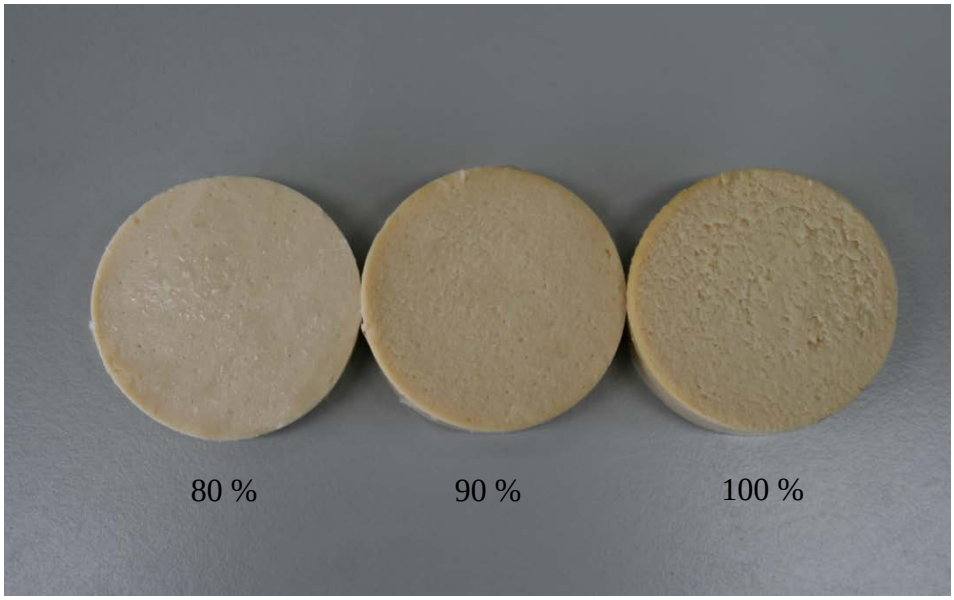


Figure A2 Cross section of surimi emulsion gel with tofu powder at various concentrations

Figure A3 The filler for forming emulsion gel

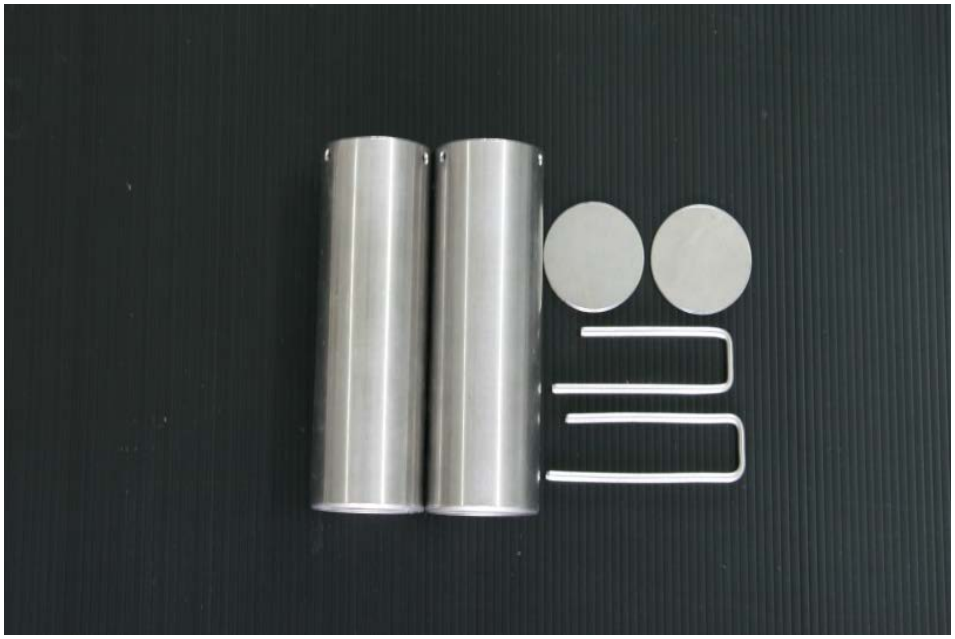


Figure A4 The mold for forming emulsion gel

APPENDIX B

Sensory evaluation form

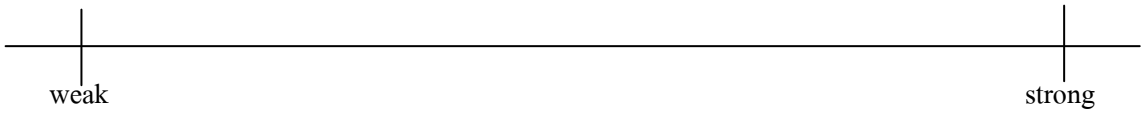
B1 Quantitative Descriptive Analysis

Descriptive analysis with QDA

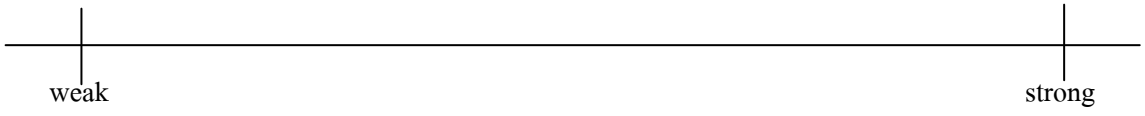
Name.....Date.....

Instruction: Please taste the product and mark the intensity for each attribute (criteria). In between tastings, take a sip of water to clean the palate.

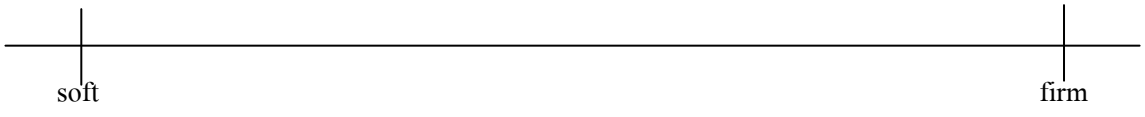
Tofu flavor



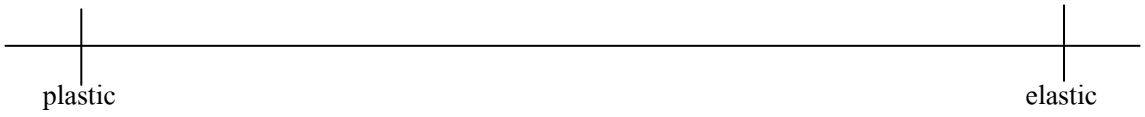
Meat flavor



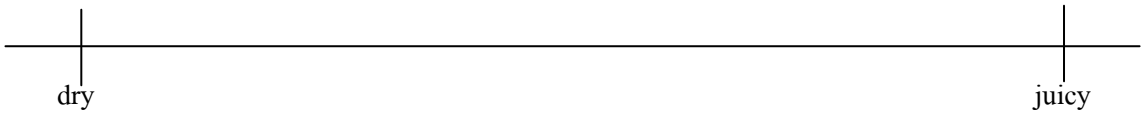
Firmness



Springiness



Juiciness



B2 Preference test

Preference Test Form

Product: Surimi Emulsion Gel mixed with Tofu Powder

Instruction: Please taste each sample and rating scale for the taste that appears on your scoring sheet. In between tastings, take a sip of water to clean the palate.

Name.....Date.....

1 = dislike extremely

2 = dislike very much

3 = dislike moderately

4 = dislike slightly

5= neither like nor dislike

6 = like slightly

7 = like moderately

8 = like very much

9 = like extremely

Attribute	Sample label						
	…….	…….	…….	…….	…….	…….	…….
Color							
Flavor							
Taste							
Texture							
Overall acceptance							

B3 Questionnaire for consumer survey

Instruction: Please mark your information

Part 1: Genneral question

1. Gender ( ) Male ( ) Female

2. Age ( ) 20-30 years ( ) 31-40 years

( ) 41-50 years ( ) 51-60 years

( ) More than 60 years

3. Education levels

( ) Primary School ( ) Secondary School

( ) High School Education ( ) Diploma

( ) Bachelor Degree ( ) Master Degree

( ) Doctor of Philosophy degree ( ) Other……

4. What is your occupation?

( ) Student ( ) House wife

( ) Bureau Officer ( ) State Enterprise

( ) Employee ( ) Entrepreneur

( ) Labor ( ) Other……

5. Do you have any annoying diseases?

( ) High blood pressure ( ) Lipidemia

( ) Diabetes ( ) Obesity

( ) Osteoarthritis ( ) Cancer

( ) Allergy ( ) Heart disease

( ) None ( ) Other(please specify)……

Part 2: Consumer behavior and consumer opinion

1. Do you eat a tofu?

( ) Yes ( ) No (skip to No. 4)

2. Why do you have a tofu? (Allowing multiple responses)

( ) Nutrition ( ) Healthy and benefit

( ) Low cost ( ) Reduce meat consumption

( ) Delicious ( ) Easy to buy

( ) Convenient to eat ( ) Other……

3. How many times do you eat tofu?

( ) 1-2 times a week ( ) 3-4 times a week

( ) more than 4 times a week ( ) 1-2 times a month

( ) Other……

4. Do you eat meat emulsion gel products?

( ) Yes ( ) No (skip to No. 8)

5. How do you have meat emulsion products?

( ) As an appetizer ( ) As an ingredient

( ) Both an appetizer and an ingredient

( ) Other……

6. Why do you have meat emulsion products? (Allowing multiple responses)

( ) Nutrition ( ) Low cost

( ) Easy to buy ( ) Many types of product

( ) Delicious ( ) Convenient to eat

( ) Other……

7. How many times do you have meat emulsion products?

( ) 1-2 times a week ( ) 3-4 times a week

( ) more than 4 times a week ( ) 1-2 times a month

( ) Other…….

8. Do you agree on replacing meat by tofu?

( ) Yes ( ) No ( ) Uncertain

Part 3: Acceptance test of the surimi tofu emulsion gel

Degree of liking		**Score**
Like extremely	=	9
Like very much	=	8
Like moderately	=	7
Like slightly	=	6
Neither like nor dislike	=	5
Dislike slightly	=	4
Dislike moderately	=	3
Dislike very much	=	2
Dislike extremely	=	1

Instruction: Please taste sample and rating scale for the taste that appears on your scoring sheet. In between tastings, take a sip of water to clean the palate.

1. Appearance .....
2. Taste and flavor .....
3. Texture during chewing .....
4. Overall acceptance .....

APPENDIX C

Demographics information of consumer from acceptance testing

Table C1 General information of the consumers

Questions	Level (%)
Gender	
Male	50.00
Female	50.00
Age	
20-30 years	40.00
31-40 years	22.00
41-50 years	18.00
51-60 years	20.00
Education levels	
Primary school	0.00
Secondary school	0.70
High school	5.30
Diploma	4.70
Bachelor degree	68.00
Master degree	21.30
Philosophy or doctoral degree	0.00
What is your occupation?	
Student	10.70
House wife	11.30
Bureau officer	41.30
State Enterprise	8.00
Employee	7.30
Entrepreneur	16.00
Labor	5.30

Table C1 (CONT.) General information of the consumers

Questions	Levels (%)
Do you have any annoying diseases?	
None	68.00
Have a disease	32.00
High Blood Pressure	23.38
Lipidemia	9.09
Diabetes	9.09
Obesity	10.39
Osteoarthritis	18.18
Cancer	0.00
Allergy	29.87
Heart Disease	0.00

Tabel C2 Consumer behavior and consumer opinion

Questions	Levels (%)
Do you eat tofu?	
Yes	94.00
No	6.00
Why do you eat tofu?	
Nutrition	29.06
Healthy and benefit	23.97
Low cost	11.14
Reduce meat consumption	11.62
Delicious	12.83
Easy to buy	5.33
Convenient to eat	6.05
How many times do you eat tofu?	
Do not eat tofu	5.30
1-2 times a week	54.00
3-4 times a week	12.00
more than 4 times a week	2.00
1-2 times a month	26.70
Do you eat meat emulsion gel products?	
Yes	1.30
No	98.70
How do you eat meat emulsion products?	
Do not eat meat emulsion product	2.00
As an appetizer	17.30
As an ingredient	17.30
Both an appetizer and an ingredient	63.00

Tabel C2 (CONT.) Consumer behavior and consumer opinion

Questions	Levels (%)
Why do you eat meat emulsion products?	
Nutrition	30.03
Low cost	9.38
Easy to buy	26.27
Many types of product	11.53
Delicious	9.12
Convenient to eat	13.67
How many times do you eat meat emulsion products?	
Do not have meat emulsion product	2.00
1-2 times a week	50.00
3-4 times a week	18.00
more than 4 times a week	4.00
1-2 times a month	26.00
Do you agree on replacing meat by tofu?	
Yes	72.20
No	8.70
Uncertain	18.7

APPENDIX D

Chemical composition of the emulsion gel

Table D1 Proximate composition of the various emulsion gels

Chemical composition	Surimi tofu emulsion gel [A]	Surimi-pork sausage[B]	Frankfurter[C]	Sausage[D]	Fish sausage[F]
Moisture (%)	41.51±0.05	54.03	51.26	61.41	68.64
Protein (%)	19.21±0.15	10.60	13.90	14.48	16.76
Fat (%)	26.19±0.57	16.81	29.68	23.41	5.64

[A]The present study,

[B]50% surimi in pork sausage (Muphy et al., 2004)

[C]3% tofu powder in frankfurter (Ho et al., 1997)

[D]Pork sausage (Cierach et al., 2009)

[F]Fish sausage (Raju et al., 2003)

APPENDIX E

Method for determination chemical composition

E1. Protein content determination (Kjeldahl method) (AOAC. 2000)

1. Weigh sample 1 g into a digestion tube
2. Add K_2SO_4 anhydrous 4.5 g and $CuSO_4.5H_2O$ 0.5 g as for a catalyst and add glass beads about 2-3 pieces
3. Add sulfuric acid 20 ml
4. Put a digestion tube on the digestion block for digesting until become clear liquid and leave for cooling
5. Add 50 ml H_3BO_3 solution with indicator to graduated 500 ml Erlenmeyer titration flask and place flask under condenser tip so that is well below H_3BO_3 solution surface
6. Add 75 ml 50% NaOH in digestion tube and connect to distillation bulb on condenser immediately
7. Heat until all NH_3 has been distilled
8. Titrate H_3BO_3 receiving solution with standard 0.1 M HCl solution to first trace of pink
9. Record ml HCl to at least nearest 0.05 ml
10. Repeat procedure the step 2-9 for making a blank, calculate results as follows:

$$\text{Nitrogen (\%)} = \frac{1.4007 \times (V_s - V_b) \times M}{W}$$

Where V_s and V_b = ml HCl titrant used for test portion and blank, respectively

M = molarity of HCl solution

W = weight of sample (g)

Multiply percent nitrogen by factor 6.25 to calculate percent protein

E2. Fat content determination (Soxhlet extraction method) (AOAC. 2000)

1. Dry the sample at 102°C for 2 hrs. to remove moisture and cool in a desiccator
2. Rinse all glassware with petroleum spirit, drain in an oven at 102°C for 30 mim. and cool in desiccator
3. Accurately weigh 5 g of sample into the thimble
4. Insert thimble in a Soxhlet extractor
5. Put about 90 ml of petroleum spirit into the flask

6. Heat the solvent in the flask until it boils. Adjust the heat source so that solvent drips from the condenser into the sample chamber at the rate of about 6 drops per second
7. Continue the extraction for 2 hrs.
8. Remove the extraction unit from the heat source and detach the extractor and condenser. Replace the flask on the heat source and evaporate off the solvent
9. Place the flask in an oven at 102°C and dry the contents until a constant weight is reached
10. Cool the flask in a desiccator and weigh he flask and contents

$$\text{Crude fat (\%)} = \frac{(W_2 - W_1) \times 100}{S}$$

Where W_1 = weight of empty flask (g)

W_2 = weight of flask and extracted fat (g)

S = weight of sample (g)

E3. Moisture content determination (AOAC. 2000)

1. Dry the empty aluminium can and lid in an oven at 105°C for 3 hrs. cool in desiccator. Weigh the empty aluminium can and lid
2. Accurately weight 3 g of sample into the aluminium can and spread the sample
3. Dry the sample in an ovent at 105°C for 1-2 hr.
4. Cool in desiccators and weight the aluminium can and dried sample
5. Repeat procedure the step 3-4 until the weight is stable

$$\text{Moistent (\%)} = \frac{(W_1 - W_2) \times 100}{W_1}$$

Where W_1 = weight of sample before drying (g)

W_2 = weight of sample after drying (g)