한국 축산식품 학회

2012년도 제44차 정기 학술발표 대회

주 제 : 글로벌 FTA시대와 국내 축산식품의 고부가가치 전략

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Laboratories of Food Engineering

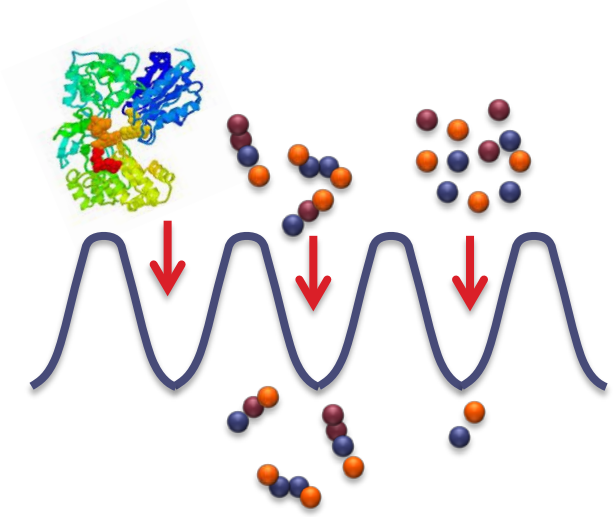
Konkuk University

Overview

- Introduction
  - Functional properties of oligopeptides
  - Micro-nanosystem in Food
- Objective
- Material and Methods
- Results and discussion
- Conclusion and perspectives

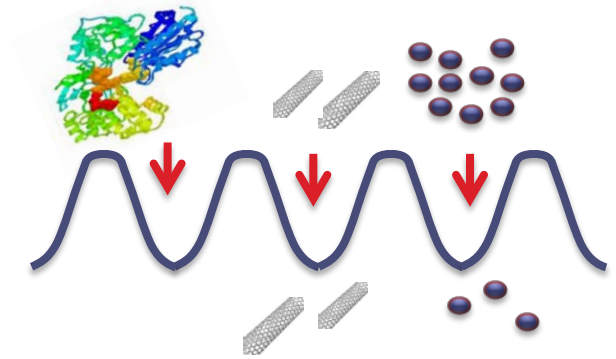
Functional properties of peptides

- 안지오텐신 전환효소 저해
- 칼슘흡수 촉진
- 혈소판 응집 저해
- 혈청콜레스테롤 감소
- 면역증강
- 비피더스균 증식
- 항균성
- 생명활동 조절 및 항상성 유지



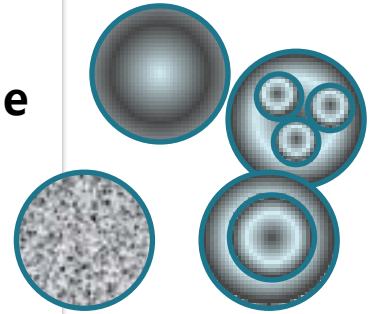
단백질, 펩타이드, 아미노산의 장관흡수율의 차이

Nanotube



Micro-nano system in food

Polymeric nanoparticle



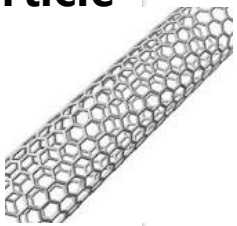
Nanoemulsion

Liposome

Cyclodextrin

Solid lipid nanoparticle

Nanotube



Application on the Food

Processing

Product

Packaging

Objective

- 실험계획법을 이용한 유청단백질의 산가수분해 조건의 최적화 및 수용성 펩타이드의 분자량 조절

- 유청단백질의 저분자펩타이드의 자가조립(self-assembly)에 의한 나노입자의 제조

Materials & Methods

Whey Protein Isolated + **Hydrochloric acid** + **Protease**

↓

Hydrolysis

↓

Seperation of soluble peptides

↓

Sodium phosphate
Sodium citrate
Sodium acetate
Buffer + **Cations** *NaCl* $MgCl_2$ $CaCl_2$

↓

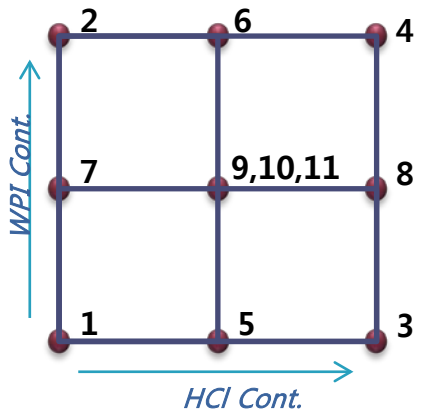
Self assembly

↓

Micro-nano particle/tube

Concentration control →

Experiment Design

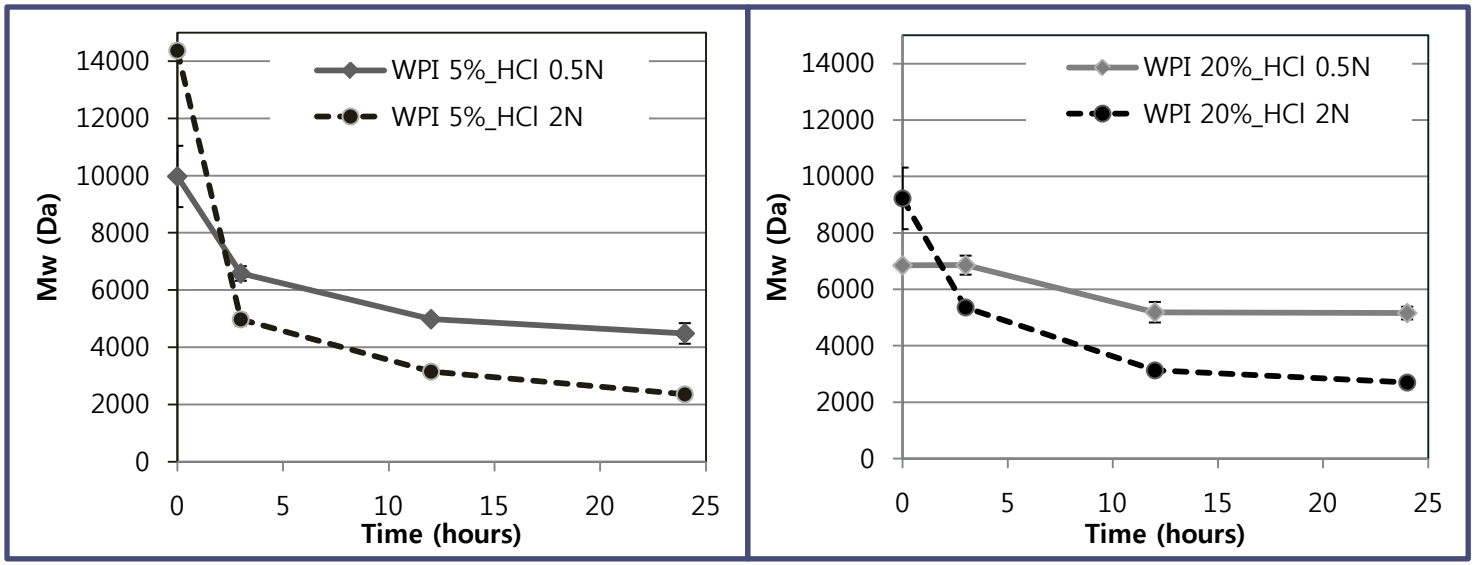


No	WPI (%)	HCl (N)
1	-1	-1
2	1	-1
3	-1	1
4	1	1
5	-1	-1
6	1	0
7	0	-1
8	0	1
9	0	0
10	0	0
11	0	0

Analysis →

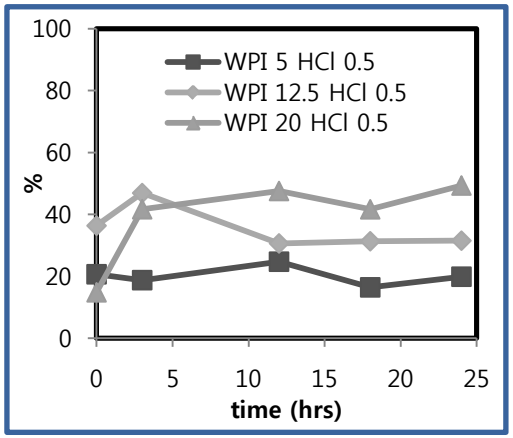
- Molecular weight (GPC)
- Thermal analysis (DSC)
- Peptide quantification (Bradford essay)
- Morphological observation (SEM)
- Particle size measurement
- Zeta potential
- Color
- Yield of process (Dry mass)

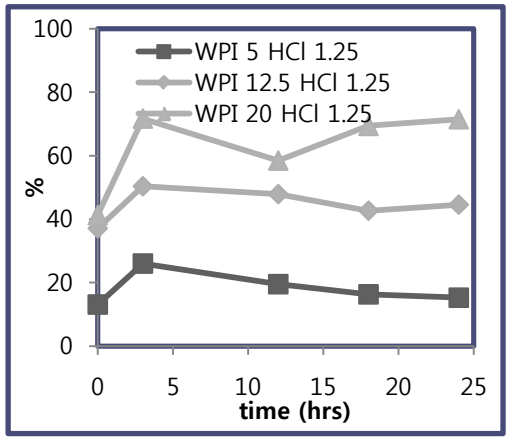
Molecular weight analysis using GPC



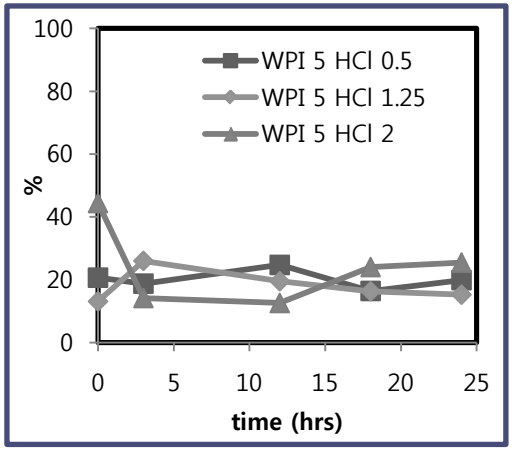
- **Molecular weight of WPI hydrolyzed at 65℃ for 24 hrs. 5% (A) and 10% (B) of WPI hydrolysed with 0.5 and 2 N of hydrochloric acid.**

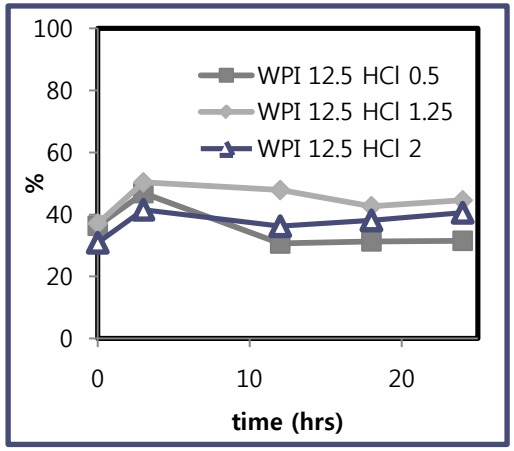
Yield of hydrolysis processing





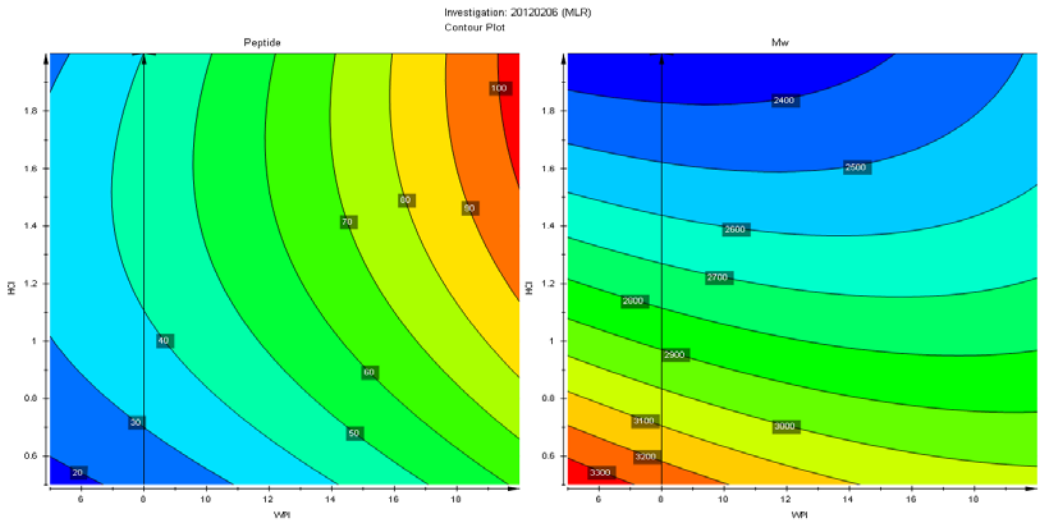
Effect of WPI concentration on the yield of processing





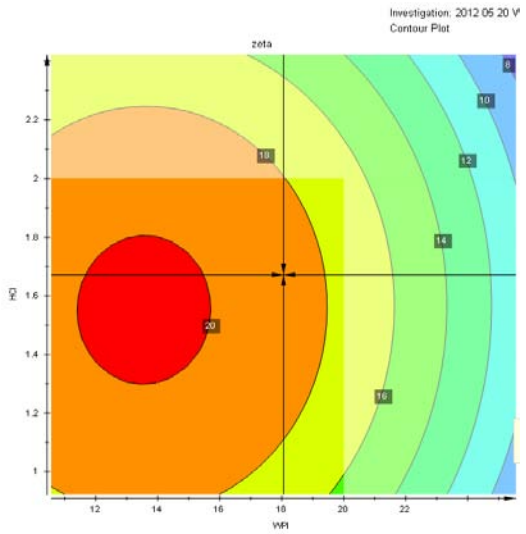
Effect of HCl concentration on the yield of processing

Optimisation of hydrolysis condition using experimental design



Peptides (%)

Molecular weight (Da)

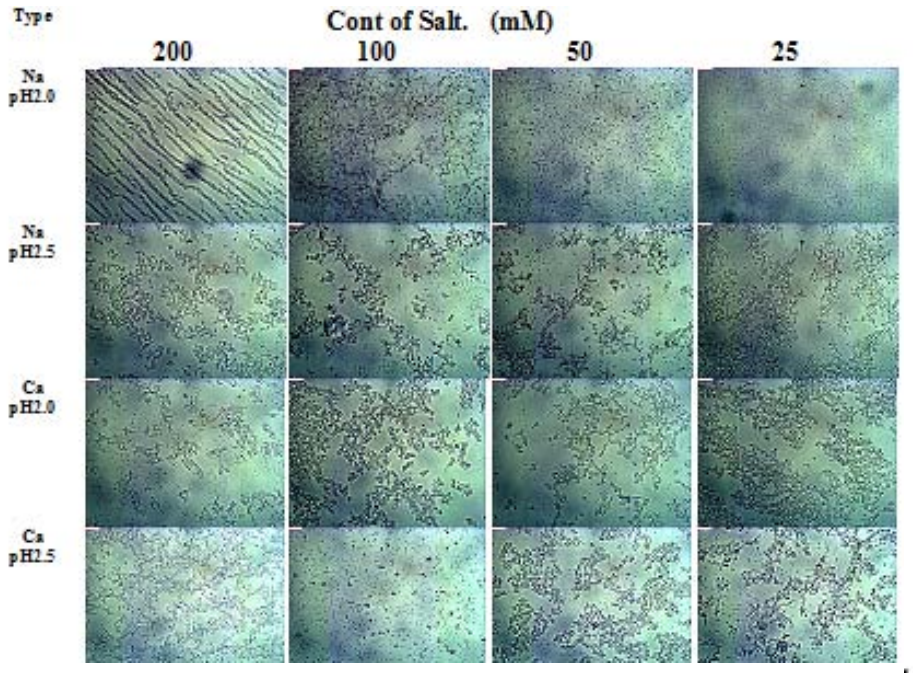


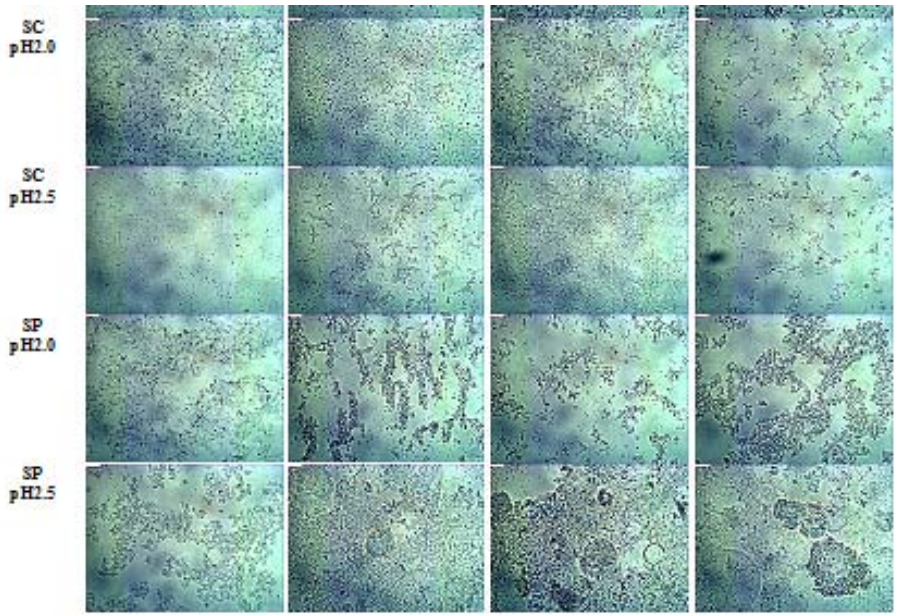
Zeta (mV)

- **As using higher concentration of WPI and HCl were used, more soluble peptide was obtained, however, lower molecular weight of peptide was obtained with lower concentration of WPI.**

- **Zeta potential value shows more negative charge as peptides was hydrolysed.**

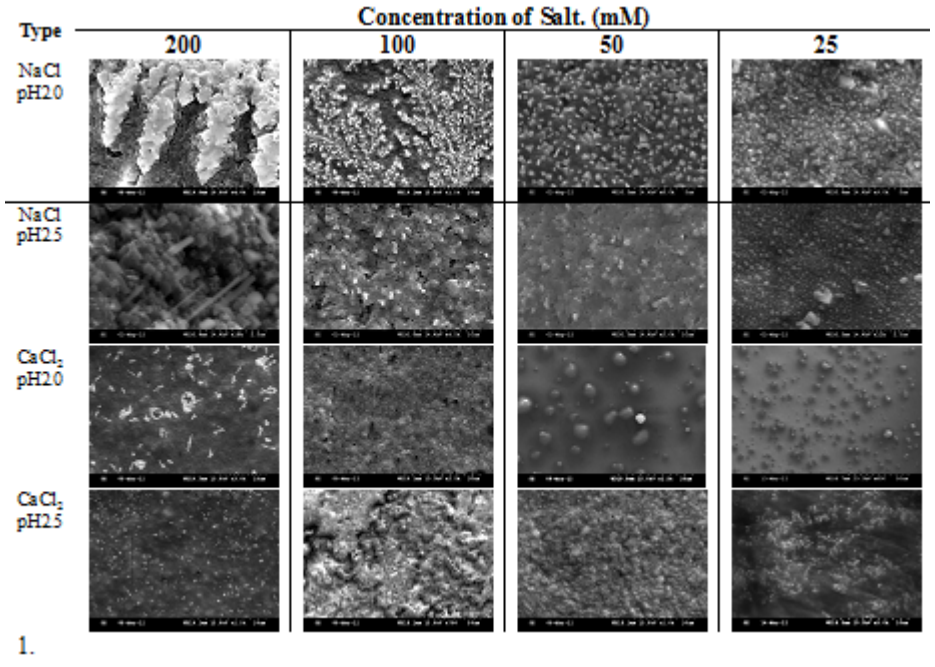
Morphological Observation –Optical Microscope

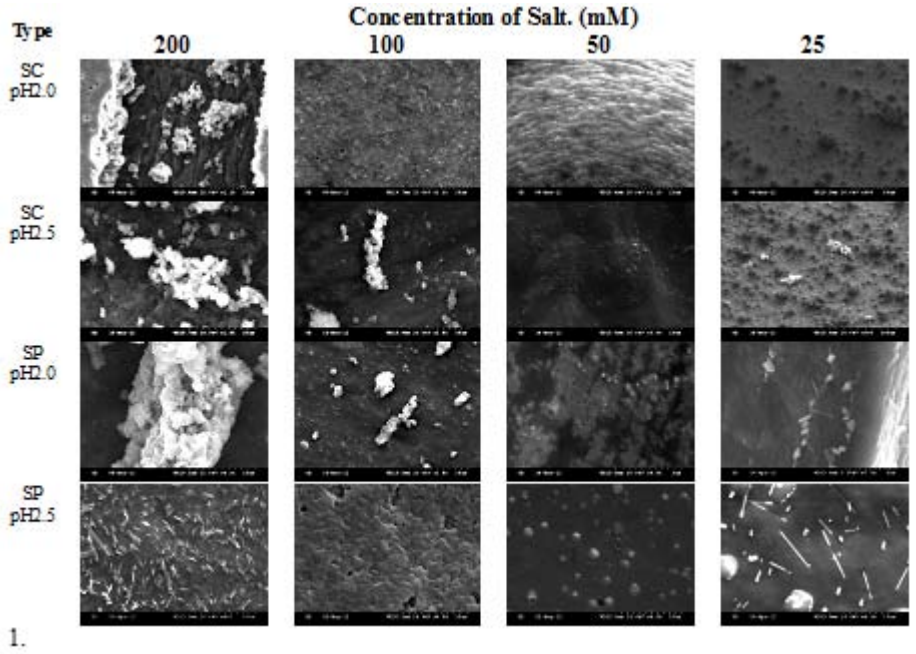




- **Microstructural properties as function of addition of various type of ion on the WPI hydrolysed; (A) NaCl, $CaCl_2$, (B) Sodium Citrate, sodium phosphate were added.**

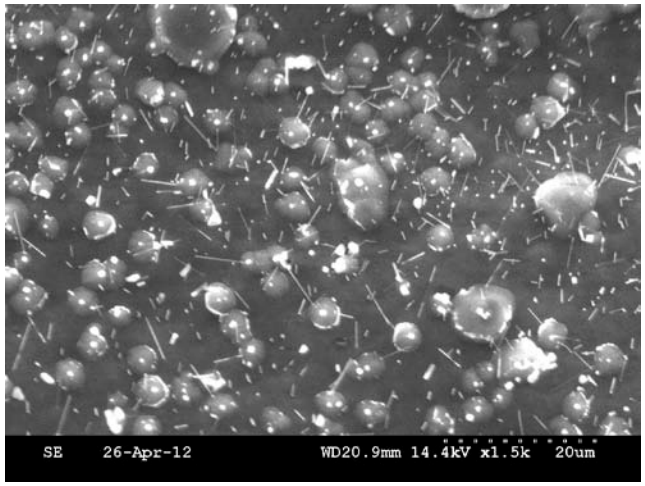
Morphological Observation – Scanning Electron Microscope

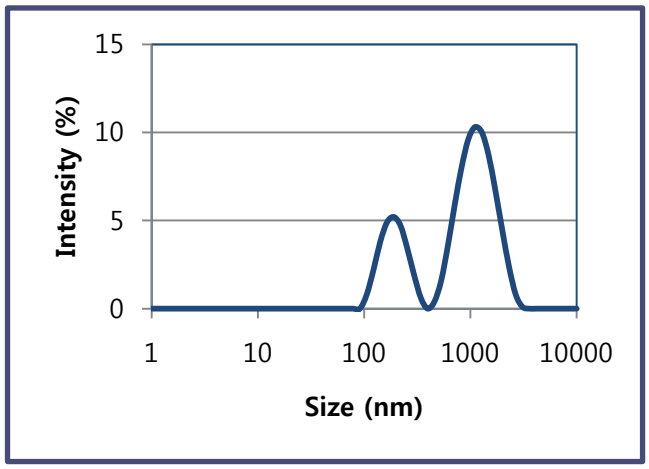


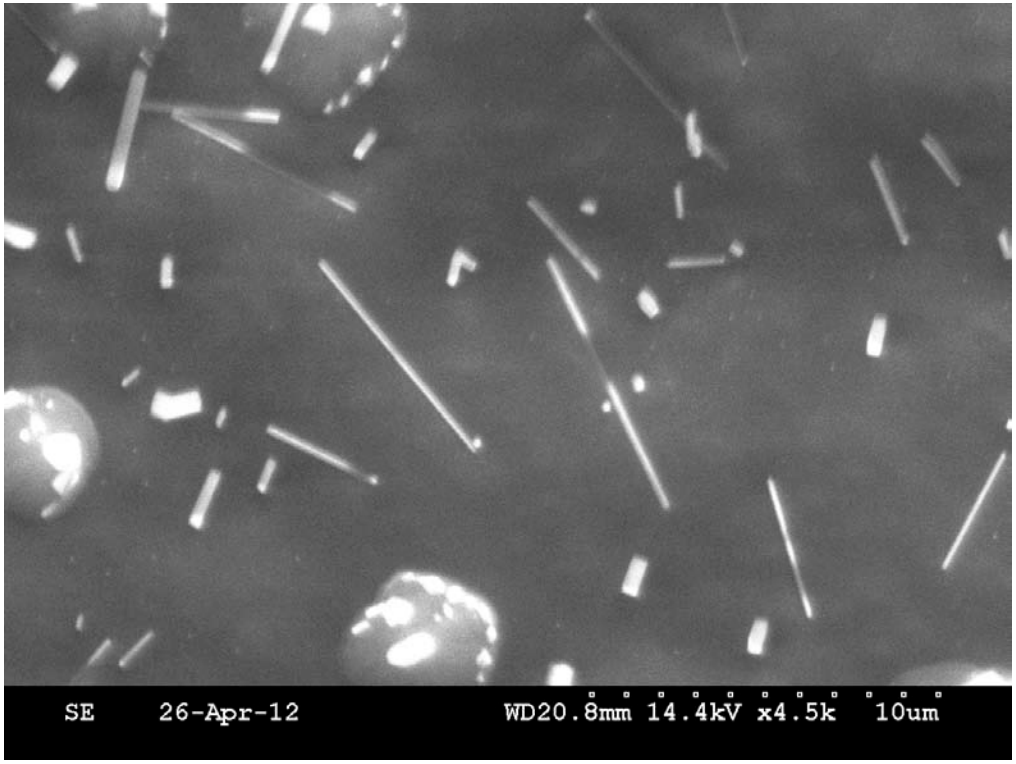


- **Microstructural properties as function of addition of various type of ion on the WPI hydrolysed; (A) NaCl, $CaCl_2$, (B) Sodium Citrate, sodium phosphate were added.**

Morphological Observation – Electron Microscope







Conclusion and Perspectives

- 실험계획법을 이용한 유청단백질의 가수분해 조건의 최적화 함으로써 효율적인 가수분해와 펩타이드 분자량의 조절이 가능하였다.

- 적절한 염의 첨가는 가수분해 되어진 펩타이드의 자가조립을 통한 나노입자나 나노튜브의 형성이 가능하다는 것이 관찰되었다.

- 추가적인 실험을 통하여 나노입자와 나노튜브의 크기 조절 및 목적으로 하는 물질의 입자 내의 효율적인 주입 및 release 속도의 조절과 효과의 검증에 관한 연구가 추가적으로 진행되어야 할 것이다.

감사합니다

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