Depolymerization of Chitosan Using a High Pressure Homogenizer

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1. Introduction

- Application of Chitosan
  - Cosmetics
  - Food
  - Textile

- Method of Depolymerization
  - Physical (Radiation)
    - Ultrasonic
    - E-beam, γ-Ray
  - Chemical
    - Acid hydrolysis
      - High Solubility
      - High Efficiency of Depolymerization
    - Sulfation
      - Enhancement of Solubility and Functionality
      - Low Efficiency
  - Biological
    - Enzymatic hydrolysis
      - Selective Decomposition
      - High Efficiency of Depolymerization
    - Cross-linking
      - High Cost
      - Low Efficiency

- High Pressure Homogenizer (HPH, Nano Disperser, ILSHIN AUTOCLAVE)

2. Experimental

- Characterization
  - Viscosity
  - Gel Chromatograph
  - FT-IR
  - XRD
  - Chitosan structure

- Operating Pressure (bar): 200 ~ 1500
- Max. Flow Rate (m/min): 100
- Pump System: Motor Driven
- Dimension (mm): 300*450*300
- Weight (kg): 30

3. Results & Discussion

- Viscosity (1% w/v Chitosan)
- Molecular Weight

- FT-IR Spectrum
- UV-Vis Spectrum

- XRD

- HPH treatment produces significant changes in the viscosity and molecular weight of the chitosan solution.
- As the pressure and number of passes increases, the polymer solution shows a significant decrease of viscosity and molecular weight.

4. Conclusion

- In the HPH process, the pressure and number of passes increases make viscosity and molecular weight decrease without any acid/alkali solution (Green Chemistry).
- The FT-IR spectra indicated no obvious modification of chemical structure of natural polymer before and after HPH treatment.
- HPH has been shown to be a valid tool to reduce molecular weight of natural polymer (polysaccharides structure).