

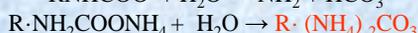
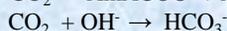
Separation of Protein Using ElectroMembrane: Study of Hydraulic-Electric Membrane Process to Purify Protein

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The purification of protein in this presented work is to investigate in the membrane process under the influence of an electric field. This paper presents with example from membrane process showing how the filtration time is reduced by the use of an electric field. The transmembrane pressure (TMP) was reduced by 20 % as the electric field increased. The concentration of protein in the membrane process in the presence of an electric field was reduced by over 300 % in comparison with the membrane process without an electric field. The hydraulic electrofiltration provides an another substitute to the crossflow filtration in the purification of protein.

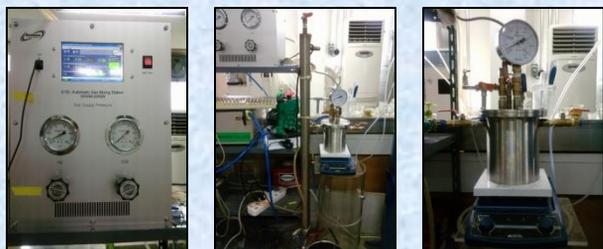
Theoretical Background



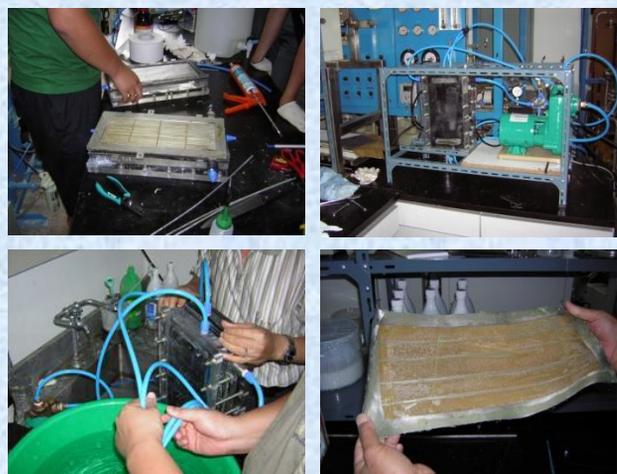
(Amine reaction with Aminoacid (Am: Amino acid))

Method

- Stirred Cell Reactor for Absorption Experiment -



- Membrane Apparatus for Protein Purification -

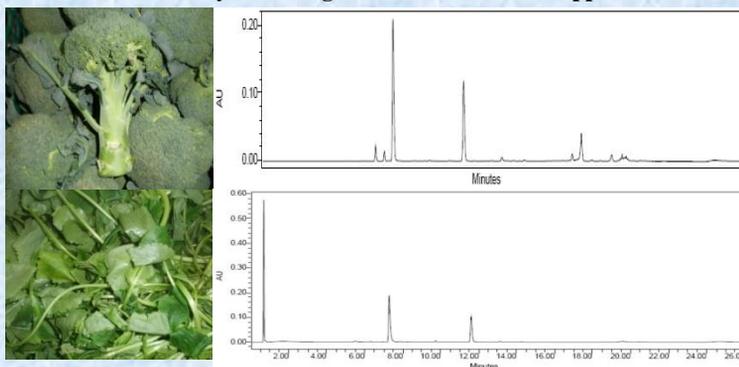


Conclusions

- As the conc. of MEA absorbents increases by 6, 12, 18 wt%, the absorption rates were obtained as 3.0×10^{-6} , 6.0×10^{-6} , 7.8×10^{-6} mol/cm²s.
- But the same experiments were performed at the plant extracts, the absorption rate were obtained as 5.4×10^{-6} , 8.8×10^{-6} , 12.1×10^{-6} mol/cm²s.

Results

- Purification of Glycine Using Electric -Membrane Apparatus -



- Exp. Results of Enhancement of Aminoacid Conc.-

| 0.1N NaOH + Spinach | k_L (cm/s) | k (s ⁻¹) | D (cm ² /s) | Ha |
|---------------------|-----------------------|------------------------|------------------------|-----------------------|
| NaOH Only | 4.38×10^{-3} | 6.08×10^{-3} | 1.13×10^{-7} | 5.98×10^{-3} |
| 1% Spinach | 4.54×10^{-3} | 7.35×10^{-3} | 1.14×10^{-7} | 6.38×10^{-3} |
| 5% Spinach | 4.79×10^{-3} | 8.15×10^{-3} | 1.31×10^{-7} | 6.82×10^{-3} |
| 10% Spinach | 5.19×10^{-3} | 9.96×10^{-3} | 1.63×10^{-7} | 7.36×10^{-3} |

| Impact category | Unit | NaOH | MEA | Plant (spinach) |
|-----------------------------|--------------------------------------|----------|---------|-----------------|
| Global warming (GWP 100) | kg CO ₂ eq | 1.18 | 3.47 | -1.52 |
| Ozone layer depletion (ODP) | kg CFC-11 eq | 2.16E-7 | 2.96E-7 | 6.9E-9 |
| Photochemical oxidation | kg C ₂ H ₄ | 0.0024 | 0.00179 | 5.11E-5 |
| Acidification | kg SO ₂ eq | 0.0156 | 0.0134 | 0.00634 |
| Eutrophication | kg PO ₄ ⁻⁻⁻ eq | 0.000961 | 0.0036 | 0.00163 |
| Non renewable, fossil | MJ eq | 17.9 | 87 | 0.839 |