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The purpose of this work was to develop a novel production process for valuable proteins by using a multi-stage cascade nano-fibrous membrane module. The experiment was carried out using C-phycocyanin (C-PC) from *Spirulina platensis* as a test model protein. Initially, the *Spirulina platensis* cells were cultured in a pilot scale photo-bioreactor. After cultivation, the algae cells were collected and disrupted by three-phase fluidized bed cell disruptor containing glass beads at a high speed agitator. The disrupted cells were then directly loaded onto the stirred fluidized bed ion exchange/hydrophobic interaction chromatography column. The partially purified product obtained from SFBA purification process was further loaded onto a cascade of membrane module reactor in series as a polishing purification step. The performance of the cascade membrane modules for purification of C-PC was carried out using various combinations of the functional membranes, such as ion exchange, hydrophobic interaction, dye-ligand, or metal affinity. The operating process variables included the diameter of membrane reactor, liquid flow flux, dilution of feedstock, number of sheet membranes for each stage, and selection of combination of membrane modules. This novel cascade purification process was used to access possibility of purifying C-PC to be homogeneous. The performance of this novel production process was used to compare the conventional purification processes.



*Fig. 1 Novel bioreactors for use in the production of C-PC from S. Platensis*

Professor Yu-Kaung Chang received his Ph.D. in Chemical Engineering at the University of Cambridge, UK. He was a Professor in the Department of Chemical Engineering/ Graduate School of Biochemical Engineering, and the Director of Biochemical Engineering R & D center at the Ming Chi University of Technology, Taipei, Taiwan. He was the Department Chairperson and the Dean of the Student Affairs. He obtained “the Scientific Award of Excellence”, American Biographical Institute, USA (2011). Dr. Chang’s main research interest is the process development of stirred fluidized bed adsorption for the direct recovery of proteins from unclarified feedstocks. Recently, his work mainly focuses on the applications of the nanofiber membrane in the CO2 capture and antibacterial fields.

**2025 BEST Conference & International Symposium on Biotechnology and Biochemical Engineering**

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