



Bioprocess: Mapping Road to Save Environment

by Associate Professor Dr. Grrace Ng Hui Suan

Looking at the global issues faced by Mother Earth today, have you ever thought of doing something that matters? Do you have the urge to join the science community in developing solutions to combat the global crisis?

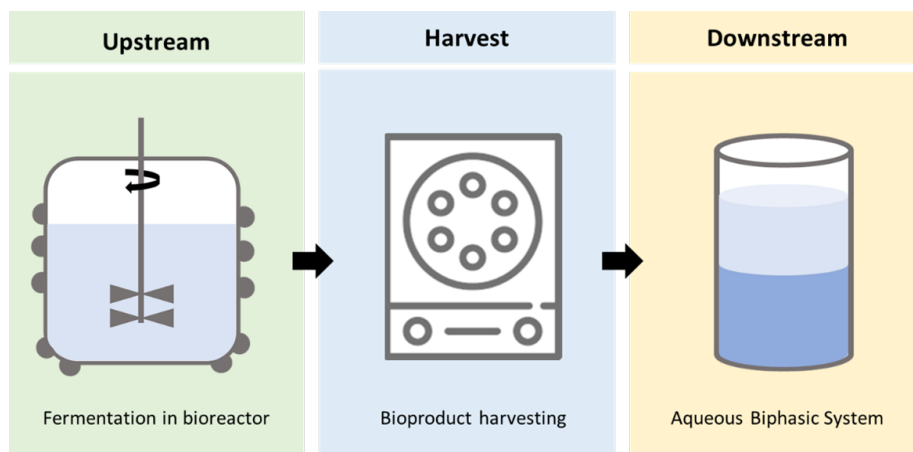
Interested in both the biotechnology and engineering fields? Wondering how waste products could be valorised into valuable bioproducts? How will we convert waste to wealth?

Bioprocess engineering offers both the knowledge in biotechnology and engineering disciplines, dealing with the development of novel technologies for the production of high-value bioproducts. Bioproducts are bio-based materials such as industrial enzymes, biofuel and bioactive compounds derived from biological resources, which could serve as sustainable alternatives to unrenewable products.

Bioprocesses are mainly classified into upstream and downstream processes. Upstream processing focuses on the production of desired bioproducts via fermentation, whereas downstream processing focuses on the extraction, separation and purification of desired bioproducts using novel and promising approaches.

For upstream processing, microbial fermentation provides advanced technologies for the effective production of bioproducts to meet the growing market demands. Our research team here at University of Cyberjaya studies the optimization of fermentation media formulation and growth condition of microorganism and microalgae for the production of desired bioproducts. Considering the increasing amounts of industrial wastes, nutrient-rich

“The environmental crisis is a global problem, and only global action will resolve it”. - Barry Commoner.



of functional compounds from food wastes due to the great content of antioxidative and bioactive compounds which could reduce environmental concern.

To-date, one of the environmental problems worldwide is the accumulation of feather waste from the poultry industry resulting from improper waste management. Keratinase enzyme is regarded as an efficient tool for the hydrolysis of keratin in feather waste to generate valuable end-products such as animal feed and fertilizer. Our research team is currently working on the production of keratinase from microbial fermentation broth due to the continuous rising market demands from various industries. Using feather waste as substrate, keratinase is produced via the microbial fermentation in the fermentation broth, followed by the separation and purification of keratinase using ABS. To enhance the efficiency of the downstream processing approach, we also study the feasibility of unconventional ABS for the recovery of keratinase from fermentation broth by integrating electric field into the ABS for the formation of aqueous biphasic electrophoresis system (ABES).

The close research collaboration between University of Cyberjaya and several universities in Taiwan provides our students with attachment opportunities to conduct their research in Taiwan and in turn expose them to a different work and research culture from

another country. Students are given a great platform to acquire research knowledge within the biotechnology, biorefinery and bioprocess engineering field.

The research team at University of Cyberjaya under the leadership of the Director of Centre for Research and Graduate Studies and Bioprocessing expert, Associate Professor Dr. Grace Ng Hui Suan is eager to meet new and eager talent interested in this field, especially if they are passionate in converting waste to wealth. Ultimately, the goal towards adopting sustainable bioprocesses in the pursuit of fulfilling one of the UN Sustainable Development Goals are in the hands of our current generation.

industrial wastes are usually applied as substrates in the fermentation media for the bioconversion of valuable bioproducts in order to achieve the goals of circular bioeconomy.

The multi-step operation of conventional downstream approaches has been viewed as a hurdle for industrial-scale practices due to long processing time and high processing cost. To circumvent the demands for an effective downstream processing approach, our research team has been studying the feasibility of a novel strategy, called aqueous biphasic system (ABS) for the recovery of various desired bioproducts from fermentation broth. This promising approach is favourable for the industrial implementation of downstream processing in one-step operation with high yields and productivity. In view of the attractive properties of ABS, it has also been widely employed for the extraction

For more details about our research, kindly refer to our publications available online at https://www.researchgate.net/profile/Hui_Suan_Ng, <https://scholar.google.com/>