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Research Interests:

The Energy/Environmental Biotechnology & Biochemical Engineering Laboratory (E/EBBE lab) was established in the Fall of 2011. The core technologies of this lab are biochemical engineering, biomass energy, biorefinery, microalgae biotechnology/engineering, enzyme engineering, and environmental biotechnology. The main purpose of our research is to develop highly efficient and commercially-viable technologies for the production of biofuels and bio-based chemicals from flue gas CO₂, renewable resources, and organic wastes/wastewaters. Recent research topics include microalgal biorefineries (e.g., biodiesel, aquaculture feed, pigments, protein, cosmetics, etc.), lignocellulosic biorefineries (e.g., bioH₂, bioalcohols, diols, etc.), biosurfactants, membrane applications, and biological recovery of valuable metals from geothermal or industrial wastewaters.

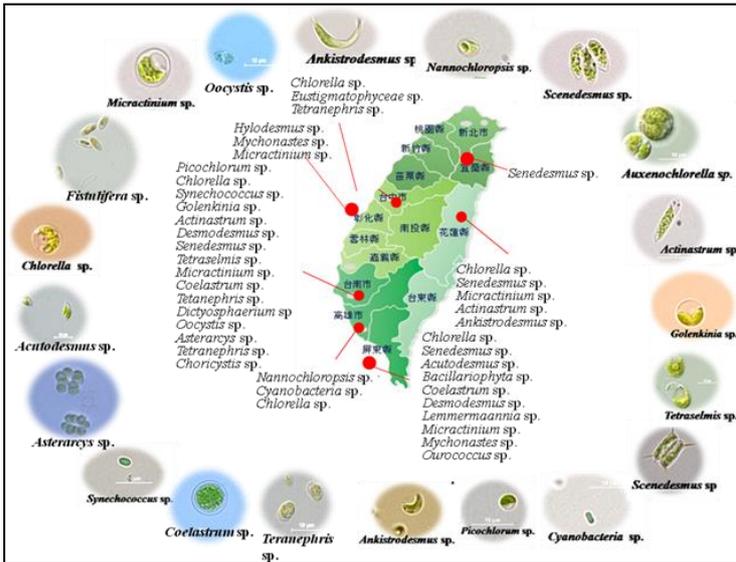
Major research achievements

- Producing biofuels (bioH₂, ethanol, butanol, biodiesel) from cellulosic and microalgal feedstocks
- Developing integrated processes for CO₂ re-utilization via microalgae platform
- Developing microalgae-based biorefinery system to produce high-value products and fine chemicals
- Establishing a demonstration plant (300 ton) for large-scale outdoor cultivation of microalgae

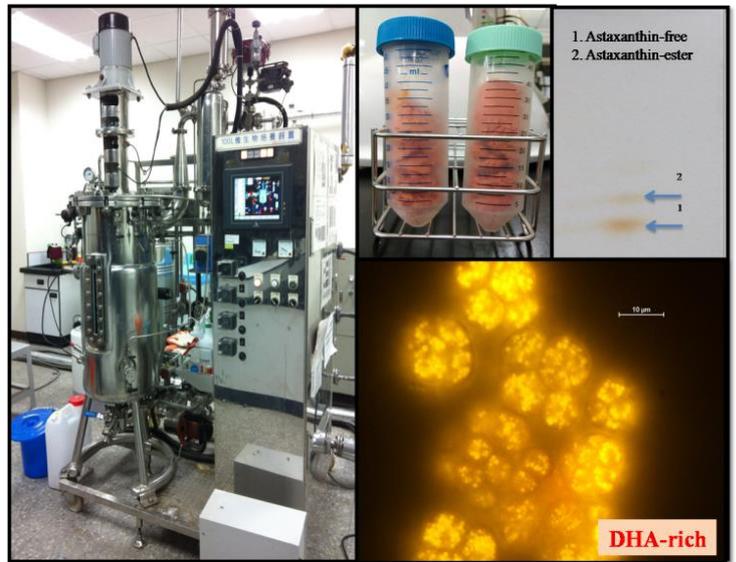
Representative Publications:

- D-T Tran, C-L Chen, J-S Chang (2016) Continuous biodiesel conversion via enzymatic transesterification catalyzed by immobilized *Burkholderia* lipase in a packed-bed bioreactors. *Applied Energy* 168: 340–350 [IF=5.746]
- WY Cheah, PL Show, JC Juan, TC Ling, J-S Chang, D-J Lee (2016) Converting wastewaters to energies: A microalgae platform. *Applied Energy* (published online) [IF= 5.746]
- D-S Lin, H-W Yen, W-C Kao, C-L Cheng, J-S Chang (2015) Bio-butanol production from glycerol with *Clostridium pasteurianum* CH4: the effects of butyrate addition and in situ butanol removal via membrane distillation. *Biotechnology for Biofuels* 8:168-180. [IF= 6.444]
- S-H Ho, A Nakanishi, X. Ye, J-S Chang, T. Hasunuma, A. Kondo (2015) Dynamic metabolic profiling of the marine microalga *Chlamydomonas* sp. JSC4 and enhancing its oil production by optimizing light intensity. *Biotechnology for Biofuels* 8:48 [IF= 6.444]
- C-C Huang, C-J Yang, P-J Gao, N-C Wang, C-L Chen, J-S Chang (2015) Characterization of an alkaline earth metal-doped solid superacid and its activity for the esterification of oleic acid with methanol. *Green Chemistry* 17:3609-3620 [IF= 8.506]
- S-H Ho, X. Ye, T. Hasunuma, J-S Chang, A. Kondo (2014) Perspectives on Engineering Strategies for Improving Biofuel Production from Microalgae – A critical review. *Biotechnology Advances* 32(8):1448-1459 [IF=9.848]
- D-T Tran, Y-J Lin, C-L Chen, J-S Chang (2014) Modeling methanolysis of triglyceride catalyzed by immobilized lipase in a continuous-flow packed-bed reactor. *Applied Energy* 126:151-160 [IF= 5.746]
- S. Aikawa, A. Joseph, R. Yamada, Y. Izumi, T. Yamagishi, F. Matsuda, H. Kawai, J-S Chang, T. Hasunuma, A. Kondo (2013) Direct conversion of *Spirulina* to ethanol without pretreatment or enzymatic hydrolysis processes. *Energy and Environmental Science* 6: 1844-1849 [IF= 25.427]

Major research activities

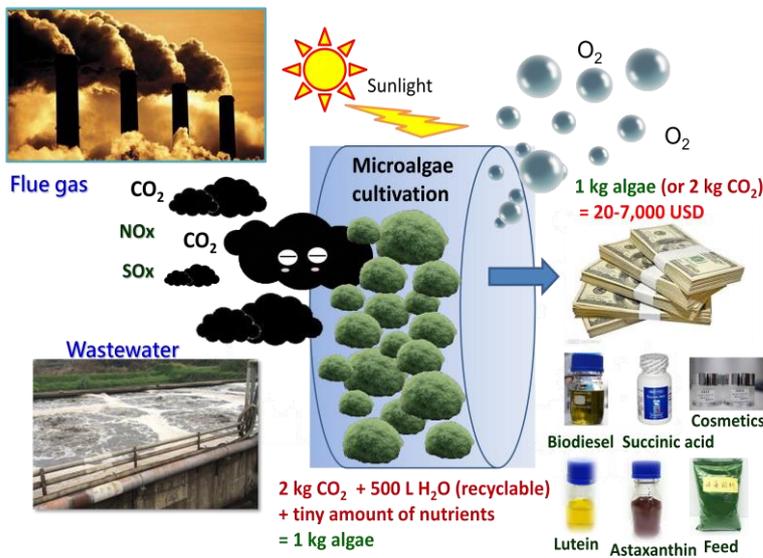


Microalgal species isolated from nature environment

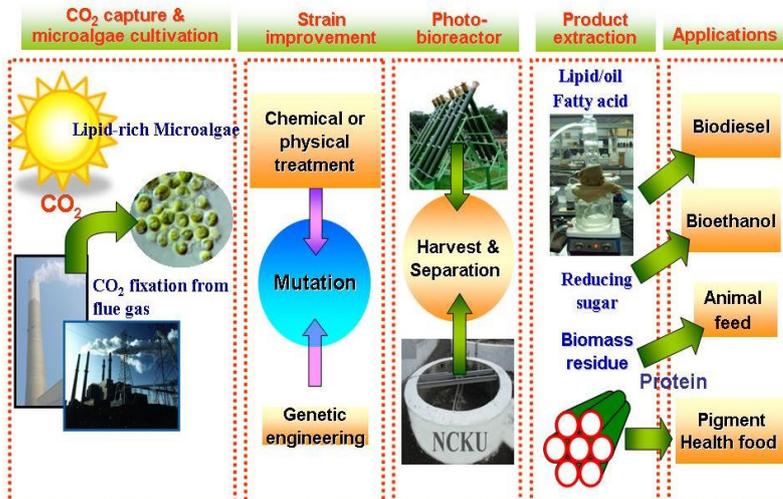


Heterotrophic production of DHA and astaxanthin

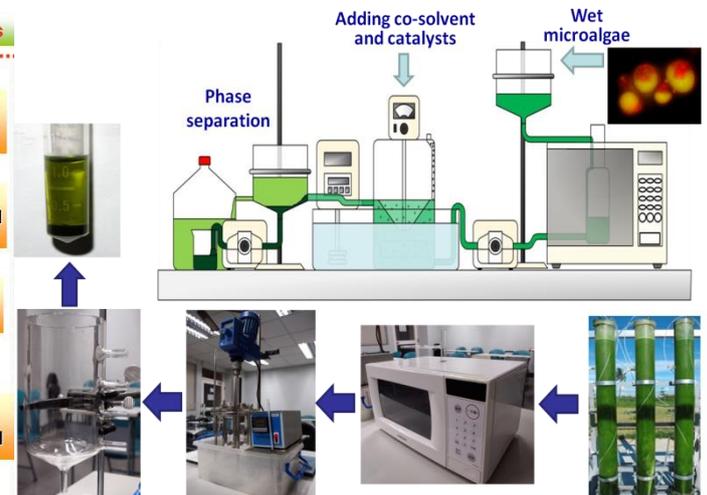
Microalgae-based carbon capture & utilization



Microalgae cultivation demonstration plant



Microalgae-based biorefinery processes



Process for biodiesel synthesis using microalgae oil