Use of effluents of anaerobic digestion and microbial fuel cells as nutrient sources for microalgal biomass production

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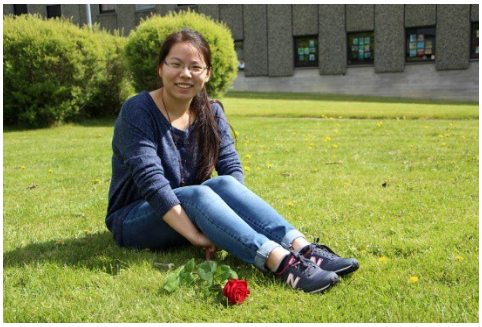
Social Impact

Fossil fuels have been used for many decades as the primary energy resource. However, the extended use of fossil fuels has caused global warming, environmental pollution and health problems. Bioenergy is becoming more popular due to its renewable, biodegradable and less toxic characteristics. Microalgae can grow faster than terrestrial plants, which indicates higher biomass productivity per area. Furthermore, carbon dioxide fixation by microalgae can mitigate the greenhouse gas emissions, and microalgae cultivation can recover carbon from exhaust gases. The effluents from anaerobic digestion have low dissolved carbon content but large amounts of ammonium. Ammonium can lead to toxicity symptoms to plants, animals, and humans, which means that the ammonium level must be decreased to meet the environmental requirements before discharging. Studies have indicated that many algae prefer ammonium over nitrate as the nitrogen source. So the effluents of anaerobic digestion are suitable media for microalgal growth.

Technological Challenges

Although microalgae biomass is a promising biofuel feedstock, and the cultivation could benefit the environment by CO_2 fixation and wastewater treatment. Research efforts are still being focused on increasing biomass productivity and energy content of the produced biomass. Microalgal biomass can be utilized to achieve various kinds of energy carriers and fuels, e.g. biodiesel, biomethane, electricity, hydrogen, and ethanol. However, how to increase the efficient use of the algal biomass is still problematic. Most of the studies have only mentioned the nutrient removal from wastewater. However, organic matter (measured e.g. as dissolved organic carbon) can remain and even increase during the cultivation. Thus, even if the nutrients are removed efficiently, the wastewater still cannot be discarded directly due to the high carbon content. Therefore, this study will focus on high microalgal biomass production and cost-efficiency of wastewater treatment.

CV researcher (PhD student)



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