INTEGRATING MICROALGAE PRODUCTION WITH ANAEROBIC DIGESTION: A BIOREFINERY APPROACH

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ABSTRACT

In the energy and chemical sectors, alternative production chains should be considered in order to simultaneously reduce the dependence on oil and mitigate climate change. Biomass is probably the only viable alternative to fossil resources for production of liquid transportation fuels and chemicals since, besides fossils, it is one of the only available sources of carbon rich material on earth. Over recent years, interest towards microalgae biomass has grown in both fundamental and applied research fields. The biorefinery concept includes different technologies able to convert biomass into added value chemicals, products (food and feed) and biofuels (biodiesel, bioethanol, biohydrogen). As in oil refinery, a biorefinery aims at producing multiple products, maximizing the value derived from differences in biomass components, including microalgae. This paper provides an overview of the various microalgae-derived products, focusing on anaerobic digestion for conversion of microalgal biomass into methane. Special attention is paid to the range of possible inputs for anaerobic digestion (microalgal biomass and microalgal residue after lipid extraction) and the outputs resulting from the process (e.g. biogas and digestate). The strong interest for microalgae anaerobic digestion lies in its ability to mineralize microalgae containing organic nitrogen and phosphorus, resulting in a flux of ammonium and phosphate that can then be used as substrate for growing microalgae or that can be further processed to produce fertilizers. At present, anaerobic digestion outputs can provide nutrients, CO_2 and water to cultivate microalgae, which in turn, are used as substrate for methane and fertilizer generation.