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ADVANCEMENTS IN HYDORTHERMAL PROCESSING OF ALGAL BIOMASS FOR CO-PRODUCTION OF BIOENERGY AND NUTIRENTS

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With rapid world population growth, there there is a greater need for food, energy and water (FEW). As cities grow, municipality water demands increase and there is increasing demand for treatment of municipality waste water (MWW). While the conventional treatment of MWW is not economically viable, biological remediation using algae biomass growth has been found as a cost-effective solution for treating MWW, recovering N and P nutrients, and generating energy. Algal biomass serves as perfect FEW nexus due to its ability to grow in low-quality water, sequester carbon dioxide and net positive environmental effects. Algal biomass is an excellent feedstock for producing liquid biofuels via hydrothermal liquefaction (HTL). HTL involves conversion of whole, wet algae biomass in hot, compressed water (270-350 °C and 8-18 MPa) into an energy-dense "bio-crude oil" along with other co-products (solid char, gases and aqueous phase). The aqueous phase is rich in N and P nutrients that are recovered via struvite precipitation. HTL can be conducted in both batch and continuous mode operations. While most of the studies world-wide report results from batch HTL conducted in 100-2000 mL pressure reactors, only handful of studies have conducted continuous HTL studies. A continuous flow reactor (CFR) system suffer from several challenges including flow of biomass slurry through pumping/preheating unit/reactor units, clogging of solids, solid-liquid-gas separation/filtration, involvement of a large number of unit operations, and safety and control issues. This presentation provides an overview of the recent progess in batch and continuous algal HTL research and co-product development.