Two Stage Process for Simultaneous Dehydration and In Situ Esterification of Wet Microalgal Biomass

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Most conventional processes for algal biodiesel production involve separate lipid extraction steps or require usage of dry biomass that incurs extra cost and energy intensive drying step. A novel process that involves dehydration of wet biomass via pretreatment with ethanol followed by direct in situ transesterification into biodiesel was investigated in this study. Under mild esterification of 80C for 30 minutes, pretreating the wet biomass twice with 3 volumes of ethanol resulted in nearly four-fold increase of FAEE yield from 3.04 mg to 11.78 mg, while increasing the ethanol from 1 volume to 10 volumes resulted in six fold increase of yield from 3.18 to 18.29 mg. The FAEE yield further increased when esterification reaction was run at higher temperature and longer durations up to 120C for 2 hours. The overall positive impact of pretreatment step on the final yield was far greater for milder reaction conditions, which makes the process more attractive in terms of economics and energy savings.