

Microalgae nitrogen recovery using hydrothermal carbonization

Silvia Roman¹, Andres Álvarez-Murillo¹, Charles Coronella² and Saeed V Qaramaleki²

¹University of Extremadura, Spain

²University of Nevada, USA

During last years, increasing concern on climate change has motivated the scientific community to find ways for carbon dioxide sequestration. In this frame, synthetic algae growth offers significant advantages, such as simplicity, fast growing rates, and potential for biodiesel production. Recently, the possibility of converting algae to other valuable products has also been studied; hydrothermal carbonization (HTC) offers many advantages over other thermochemical processes, because of its low cost, favorable energy balance, and does not require an expensive drying step. Several works have showed the potential of HTC for increasing the heating value of biomass; however, very few studies have been devoted to study how experimental conditions affect N fixation on the hydrochar (HC), which can be highly desirable for some applications, such as adsorption or production of electrode materials. Moreover, the migration of N to the liquid phase (LP) might also be interesting allowing its further use for algae growing. In this work, Microalgae *Scenedesmus* was chosen for study because of its outstanding ability to grow in variable culture media. The HTC process was conducted under different conditions (temperature, time and biomass loading), hydrochars with variable N content were obtained, and the chemical equilibria involved in the process were investigated. HPLC analyses on the LP allowed identifying numerous N containing species. The fate of other nutrients (P, K, Na, Ca & Mg) was also investigated. It was found that while temperature had a clear effect on solid yield, its effect on the HC composition depended on the other variables. In general, for shorter HTC times (5 h), higher temperatures enhanced protein hydrolysis and thus the migration of N to the liquid phase in the form of amino acids which were further decomposed to O and N-containing species (carboxylic and organic acids, amines and ammonia). For larger time periods (20 h) temperature only played a secondary role and N fixation on the HC was significantly reduced in relation to 5 h experiments. Biomass loading did not show a significant effect on N distribution.

Biography