CATIONIC STARCH FLOCCULANTS FOR MICROALGAE BIOMASS SEPARATION

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In the context of the overuse of fossil fuels, such as coal and oil, world is now facing environmental, energy and health challenges. Some studies have indicated that microalgae are a promising feedstock of biofuel for alternating fossil fuels. Since microalgae are small in size, of approximately 2–12 μm, and possesses a negatively charged surface, the algal cells are suspended in medium as colloidal particles. Microalgae harvesting is difficult, time consuming, and costly. Among the traditional microalgae harvesting methods are flotation, filtration, centrifugation and flocculation. Flocculation is a comparatively low-cost method that can be applied at large scale. The synthetic flocculants are derived from petroleum products. Therefore, the starch-based flocculants could be a suitable alternative to replace synthetic ones [1]. The aim of this investigation was to obtain cationic starches (CS) and to evaluate their thermal, biodegradation and flocculation properties.

Cationic starches of different degree of substitution were obtained by etherification of native potato starch with 3-chloro-2- hydroxypropyl trimethylammonium chloride by using NaOH and CaO additives. The CS biodegradation tests in a compost were carried out according to ISO 14855-2 standard. The thermal properties of CS and microalgae were also evaluated. The flocculation properties were assessed by evaluating filtration efficiency of microalgae dispersions using a standard capillary suction time apparatus. It was determined that microalgae flocs would be readily and rapidly dewatered after the destabilization process involving CS flocculant (see Fig. 1). Hence, CS can be considered as an effective biodegradable modified starch flocculant suitable for thickening and dewatering of microalgae.

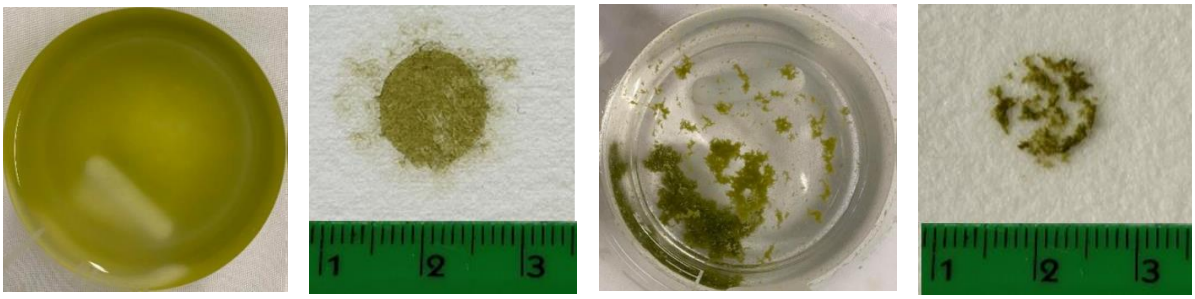

Fig. 1. The photographs of microalgae dispersion (a), dewatered microalgae (b), microalgae dispersion after flocculation with $CS_{0.28}$ (c), dewatered microalgae after flocculation (d). Microalgae concentration was 0.7 g/l

The use of derivatives of natural starch e.g. cationic starches has the advantages of both low price and biodegradability, moreover, their decomposition products are environmentally friendly, and they can be produced from renewable sources.

References

1. A. Mohseni, L. Fan, F. Roddick, H. Li, Y. Gao, Z. Liu. J. Appl. Phycol. **33** (2021) 917–928.