Chitosan-graft-polydiallyldimethyl ammonium chloride for microalgae harvesting from wastewater

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ABSTRACT

Harvesting microalgae is considered as a bottleneck to the process of microalgal biofuel production. Coagulation and flocculation of microalgae is shown to be the most suitable method of large-scale harvesting of microalgae. This study focused on synthesizing chitosan-g-polyDADMAC by grafting polydiallyldimethyl ammonium chloride onto the chitosan molecule to remove microalgae and total phosphorus (TP) from wastewater. Chitosan-g-polyDADMAC showed higher positive zeta potential than chitosan at all values of pH tested. Chitosan-g-polyDADMAC exhibited no isoelectric point characteristic of unmodified chitosan. Flocculant to algae mass ratio of 1:1 was required for chitosan-g-polyDADMAC to achieve 70% total suspended solids removal whereas, chitosan was required in the ratio 2:1 for 50% suspended solids removal. TP removal of nearly 20–25% was achieved with chitosan and chitosan-g-polyDADMAC at flocculant to algae ratio of 3:1. The use of chitosan-g-polyDADMAC as compared with unmodified chitosan has the potential to reduce material costs of microalgae harvesting.

Keywords: Chitosan modification; Harvesting; Microalgae; Phosphorus; Polydiallyldimethyl ammonium chloride

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