



Freshwater and marine microalgae harvesting with magnetic microparticles

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Microalgae are considered to be the most promising new source of biomass and biofuels. The use of microalgae for sustainable biofuel production is important because of the lack of hydrocarbons sources. Many studies have focused on the recovery of microalgae biomass from the growth medium in order to reduce production cost. Alternative technologies, other than conventional methods (i.e. centrifugation, coagulation-flocculation, filtration and screening, gravity sedimentation, and flotation), capable to process large volumes of microalgae cultures at a low cost, are essential for microalgae biomass production.

The aim of this study was to investigate the harvesting of microalgae cells using magnetic materials (magnetic activated carbon, magnetite microparticles) compared to common flocculants ($\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$, AlCl_3 , $\text{Al}_2(\text{SO}_4)_3 \cdot 18\text{H}_2\text{O}$), and gravity sedimentation. *Scenedesmus rubescens* and *Dunaliella tertiolecta* were selected as representative for freshwater and marine microalgae, respectively. The cultivation of microalgae was conducted under continuous artificial light, in 10 L and 20 L flasks. Samples were taken at different operation intervals to conduct harvesting studies. Batch experiments were conducted to investigate the effect of sorption of microalgae on the magnetic material. The experimental data in the presence of magnetic material were adequately described by the Langmuir isotherm. *Scenedesmus rubescens* was better adsorbed and harvested than *Dunaliella tertiolecta*. Furthermore, the recovery of microalgae biomass was greater in cultures with high cell concentration compared to cultures with low concentrations. The results of the jar-test experiments showed that the AlCl_3 was more effective than the other two flocculants tested. Specifically, the harvesting efficiency was up to 99% for both microalgae species. Gravity sedimentation was tested for 1 h in both species, and better sedimentation efficiency was observed with the *Scenedesmus rubescens*.