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Zeta potential: Key to harvesting algae for biofuels and bioproducts

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Algae is an effective and sustainable resource for creating a broad spectrum of bioproducts. Scientists have found it challenging to harvest algae due to the difficulty of collecting algae when in an aqueous solution such as wastewater. Rotating Algal Biofilm Reactors (RABRs) coated with carbon nanotubes have proved effective. The RABR floats in an aqueous environment and attracts charged algal particles in suspension. The tendency for algae to favor suspension over coagulation occurs only when particles of algae are sufficiently charged. This charge can be measured by analyzing the electric potential at the interface between the surface of a particle and its aqueous environment, known as zeta potential. The zeta potential of two species of algae, Scenedesmus obliquus and Chlorella vulgaris were measured, in order to select the most appropriate algae for effective RABR harvesting.

Cultures of Scenedesmus obliquus and Chlorella vulgaris were prepared in triplicate flasks using a BG11 medium and placed on a shaker table to promote growth. Samples of 1.5 mL from each flask were pipetted into cuvettes for analysis and the flasks were placed back onto the shaker table. Optical density was measured and recorded to monitor growth using a UV spectrophotometer at a wavelength of 750 nm. Zeta potential was then measured using a ZetaPlus zeta potential analyzer. Measurements were taken every other day for a total of 48 days.

Optical density measurements were recorded for 48 days as shown in Figure 1. These measurements confirmed the steady growth of algal biomass in both samples. The presence of algae was also confirmed visually as shown in Figure 2. Zeta potential was recorded for 48 days as shown in Figure 3. Suspension occurs at values above ±20 mV, though stable suspension occurs at values above ±30 mV. Chara vulgaris exhibited some colloidal properties while Scenedesmus obliquus did not exhibit colloidal properties.

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