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Microalgal engineering aspects of biopolymer production

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Many analyses have been carried out about the future possibility of exhausting the planet's resources and its ability to sustain its inhabitants. The use of microorganisms and their metabolic products by humans is one of the most significant fields of biotechnology. Microalgae are descendants of the first photosynthetic life forms. More than 3,500 million years ago the atmosphere was made up of microalgae with oxygen, since then, they have contributed to regulating the planet's biosphere. The use of solar energy through photosynthesis in microalgae cultivation is a clean, efficient and low cost process, since the sun's energy is virtually free and unlimited. The biomass of microalgae and its processing products are employed as biopolymers. Biopolymers can be produced using biofixation of carbon dioxide by microalgae and could reduce dependency on both petroleum and carbon dioxide emissions. Cyanobacteria have potential for the production of biopolymers and their yield can be increased by stressing the culture via nutrient limitation or other means, use of recombinant strains, control of metabolic flux and the use of different bioreactor types. Unlike with crop plants, the cultivation of microalgae does not require the use of large areas of ground and can occupy areas inappropriate for agriculture and thus do not compete with food production. The biopolymers from microalgae have thermoplastic, mechanical and physical properties similar to polypropylene. They are biocompatible, recyclable and biodegradable and produce zero toxic waste since they biodegrade into carbon dioxide and water by microbial attack in about three months to one year.

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