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Algal Photosynthesis-Driven Bioremediation Coupled with Renewable Biomass and Bioenergy Production

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Inventors

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Invention Description

The two greatest challenges facing the world in the 21st century are environmental degradation and sustainable energy. Global warming due to increased greenhouse gases, along with widespread water pollution with nutrients (such as nitrogen and phosphate) and other contaminants are major environmental concerns. Conventional techniques for pollution control are typically very expensive, have high energy consumption, and generate large quantities of sludge which requires disposal. Production and consumption of fossil fuels are major causes of air and water pollutions and is nonsustainable to boot. There is no existing technology that can economically attend to both needs.

Researchers at Arizona State University have developed an alternative approach that can effectively remove nutrients from wastestreams while simultaneously produce high oil-containing fuel feedstock. This technology uses selected species/strains of microalgae (in particular *Pseudochlorococcum* spp.) grown in innovative photobioreactors to rapidly remove nutrients from wastewater and power plant flue gases and convert them into value-added compounds stored in algal biomass. The biomass can then be used as feedstock for production of liquid biofuel and/or fine chemicals, used as animal feed or organic fertilizer, etc.

This algae-based approach is quite unique and effective in performing these dual functions with high efficiency.

Potential Applications

- Algae-based renewable biomass/energy production
- Microalgal carbon sequestration from fossil fuel-fired power plants
- Wastewater treatment
- Production of algae-based nutraceuticals and pharmaceuticals
- Production of algae-derived fine chemicals including polysaccharides for cosmetics
- Production of algae for organic fertilizers and soil amendments

Benefits and Advantages

- Not only removes nutrients from wastestreams, but also recycles them in form of renewable biomass and fine chemicals
- Requires no added nitrate and/or ammonia
- Produces minimal sludge
- Produces 20 - 40 times more fuel feedstock per land area compared to conventional oil crop production
- Can be cultured in arid and semi-arid environments, so no competition with oilseed plants for limited agricultural land

Intellectual Property Status:

Patent Pending

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