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Innovative Technology for Capturing CO2 Using Rainwater and Enhancing Marine Microorganism Growth

Abstract: This paper proposes a novel environmental technology designed to mitigate the effects of fossil fuel combustion by capturing carbon dioxide (CO2) directly from rainwater. This method leverages the natural chemical properties of rainwater and the vast surface area of the oceans to create conducive conditions for the growth of specific marine microorganisms that thrive in brackish water conditions.

Introduction: During the condensation of water vapor into clouds, chemically pure water is formed. After condensation, the rainwater droplets are chemically active and, in the absence of mineral substances in their environment, absorb CO2 from the air, rendering the water slightly acidic with a pH of around 6. This naturally CO2-enriched rainwater can be processed in various ways to extract CO2 on land using mineral compounds. However, the most effective method of binding CO2 involves utilizing the extensive surface of the oceans.

Methodology: The proposed technology involves using rainwater to create optimal conditions for the growth of microorganisms that prefer the transitional conditions between fresh and saltwater. Massive strips made from sunlight-transparent material would be deployed on the ocean surface. These strips would absorb the rainwater saturated with CO2 and mix it in proper proportions with seawater. This process would facilitate the controlled growth of photosynthesis-capable microorganisms, likely necessitating mechanisms for the expulsion of excess oxygen to maintain optimal photosynthetic conditions.

An example of an organism that thrives in such transitional water conditions is *Prymnesium parvum*. The regulation of bloom could be managed using several mechanisms, including the influence of electric fields generated before storms to stimulate microorganism activity.

Design: The construction of these large strips would include numerous small valves on their upper surface to quickly absorb rainwater, preventing the release of captured CO2 before it enters the strip interior. The valves allowing rainwater inside could be electrically regulated, which could also control the intensity of microorganism blooms. Creating a vacuum to draw water into the strip's interior would not require significant energy, with perovskite solar panels printed on the strip's surface supplying power. These solar panels could transmit light of specific wavelengths conducive to microorganism growth while converting the rest of the solar spectrum into electricity. The lower valves for drawing in seawater could be spaced further apart, as achieving the proper mixture with rainwater does not require rapid action.

Conclusion: The accumulation of carbon-rich biomass from the microorganisms should only occur in the deepest ocean areas, where it would minimally impact the environment. The addition of seawater mixed with fresh rainwater could also help reduce the acidification of the oceans, which is rapidly destroying coral reefs. By implementing this technology on a large scale, it is possible to extend the use of current fossil fuel technologies and facilitate a smoother economic and social transition to renewable energy sources, while potentially lowering or maintaining current atmospheric CO2 levels.