Recycling Carbon Dioxide

Through the genetic modification of photosynthetic bacteria, carbon dioxide could be recycled into cleaner sources of fuel.

GLOBAL CLIMATE CHANGE HAS STIMULATED EFFORTS to reduce net CO₂ emissions. One potential approach to address this problem is to recycle CO₂ as a backbone for producing fuels or chemicals using photosynthesis. Photosynthetic organisms use solar energy to incorporate atmospheric CO₂ into organic molecules, but none of these organisms produce any molecules that are suitable for use as a liquid fuel. We aim to genetically modify photosynthetic bacteria to build CO₂ into C4-C5 alcohols, which have great potential as an alternative to petroleum-based fuels. Additionally, extracting the final product from the production mix is a simple process as the fuel is easily vaporized. This new strategy possesses two advantages for the long-term, global-scale goal of achieving a cleaner and more sustainable energy economy.

The benefits of this process include:

- The recycling of CO₂, which reduces net greenhouse gas emissions compared to the burning of fossil fuels;
- The use of solar energy to directly convert CO₂ into a liquid fuel that is compatible with existing infrastructure and technology—including in most automobiles.

In addition, the need for biomass deconstruction—either in the case of cellulose or algal biomass—is avoided, relieving a major economic barrier for biofuel production. An ideal place for this system would be next to existing power plants that emit concentrated CO₂, potentially allowing the flue gas to be scrubbed and recycled directly into liquid fuel.

This system recycles CO₂ to reduce greenhouse gas emissions resulting from the burning of fossil fuels.
It uses solar energy to convert CO₂ into a liquid fuel that can be used in the existing energy infrastructure, including in most automobiles.


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CONTACT:
Shota Atsumi, Ph.D
Dept. of Chemistry
satsumi@ucdavis.edu
(530) 752-6595
www.chem.ucdavis.edu/faculty/cf-info.php?id=0

CREDITS:
M.R. Connor,
G.M. Rodriguez
E.N. Lamsen
S. Atsumi