Artificial Photosynthesis

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ohtoptens.com
Agenda

- Introduction
- What is Artificial Photosynthesis?
- Splitting CO2 with a Catalyst
- Bacteria Breaking Down CO2
- Converting Biofuels by a Photoelectrochemical Cell
- Conclusion
Artificial Photosynthesis

- Converting sunlight, CO2, and water to oxygen/fuel through unnatural processes
- Benefits:
  - Reduces excess CO2
  - Environmentally friendly
  - Renewable
  - Instantaneous
- Limitations:
  - Production low
  - Expensive

Splitting CO2 with a Catalyst

- CO2 → CO + \( \frac{1}{2} \)O2
- Catalyst - as substance that causes or speeds up a chemical reaction
- Ruthenium is fastest/most efficient
- Cons
  - Not readily available or cheap
  - Produces CO
  - Low amount of O2 produced

Bacteria Breaking Down CO2

- Energy from sunlight
  - Nanowires
- CO2 reducing bacteria
- Produces acetate
  - Fuel and polymers
- Cons
  - 3% efficiency
  - Short lifespan
- Goal for consumer availability
  - 10% efficiency

Converting Biofuels by a Photoelectrochemical Cell

- Convert water and sunlight into fuel
  - Photo-absorber and Catalysts
- Cons:
  - Produces small amount of hydrogen
  - Hydrogen fuel cannot be used efficiently yet
  - Costly/Not efficient

Stanford
http://www-ssrl.slac.stanford.edu
Conclusion

● What is Artificial Photosynthesis?
● Three Methods
  ○ CO2 can be split with catalyst
  ○ Reducing CO2 with bacteria to produce fuel
  ○ Converting Biofuels by a Photoelectrochemical Cell
● Pros: Utilizing the sun to create environmentally beneficial fuels/oxygen
● Cons: Renewable resources are expensive/inefficient
● Looking to become more efficient in the future
References


