



Breakout Session II

Group A

Wednesday, October 21, 2009

Given the results of the first break-out sessions, what is the most promising approach to the development of an efficient, robust system capable of the production of direct-solar fuels, i.e. of harvesting photons and producing infrastructure-compatible high energy density liquid fuels in a single reactor?

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Technical Steps –

Three approaches

1. Synthetic photon capture, water oxidation and carbon fixing (biggest challenge is the catalysts - FT)
2. Biological photon capture – water splitting and carbon fixation
 - Efficiency of biology is challenge, photobioreactors
 - Currently algae around 1% efficient in converting CO₂ to fatty acids and lipids, need about a 10 x improvement in efficiency on energy basis (streamline metabolism, minimize by-products, increase flux)
 - High salinity, high pH organisms
 - Genetic and systems tools largely available or could be developed but the latest technologies, tools, and expertise tend to be scattered
3. Hybrid inorganic/biological approach

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Major Challenges –

- Cheap solar hydrogen would facilitate FT production of fuels
- Bring many disciplines, tools and technologies together to address challenges
- Funding work with little or no preliminary results, but with big potential payoff
- Integrating specific disciplines and advances to develop a complete working system – will answer many of the questions we have today just through this exercise
- Is the funding amount sufficient?

Interesting idea - Growing biofilms on wires – electrons from solar panels, cells “absorb” electrons and fix CO₂ biologically

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Potential –