

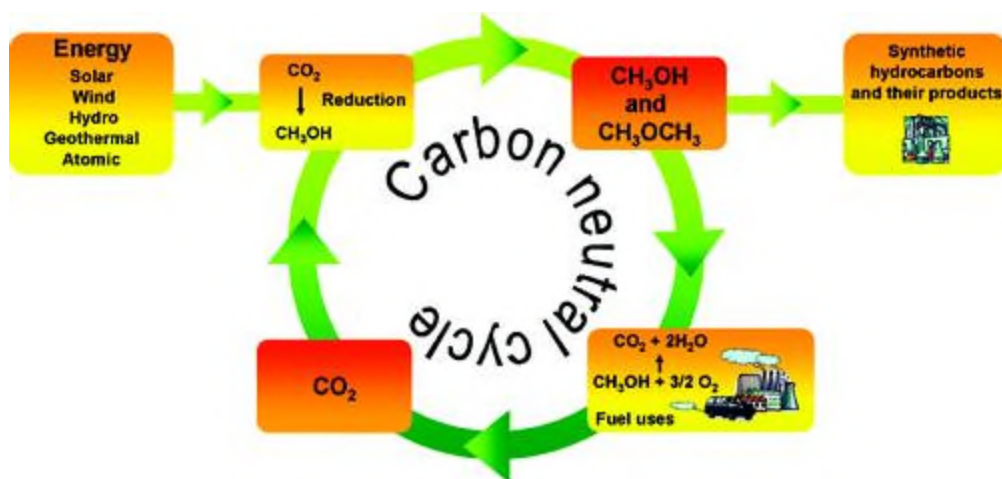
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Proponents of Methanol Economy Win 1 Million Prize

Drs. George A. Olah (Nobel Laureate) and G.K. Prakash received a \$1 million award from the State of Israel for their 30 years of work promoting methanol (MeOH) as the basis for alternative fuels. Their work has delved into feedstocks and processes to make MeOH as well as using MeOH in a variety of ways. The prize was the inaugural awarding of the Eric & Sheila Samson Prime Minister's Prize for Innovation in Alternative Fuels for transportation. This award was established to encourage the reduction of Israel's dependence on foreign oil.

MeOH is a liquid that is extremely clean burning. It was for many years the only fuel used in Indianapolis 500 racing. It is easily made by several methods. Currently the most cost effective method is steam reforming of natural gas to make a mix of hydrogen and carbon monoxide (called "syngas"). The syngas is passed over a Cu/ZnO/Al₂O₃ catalyst to make MeOH quite selectively. Under the right conditions it can be made with very high purity and essentially no sulfur or nitrogen compounds (problems in fuel application).

Olah and Prakash have long proposed that MeOH was the best alternative fuel for a number of reasons. Its simple, single carbon chemistry makes it relatively easy to make from a wide variety of fossil and renewable sources including natural gas, bio-generated methane, coal, woody biomass and agricultural wastes. The bio-mass sources can be readily turned into "syngas" by a variety of methods – several of which have been demonstrated at or near commercial scale. The "syngas" can then be turned into MeOH using the same or similar process to that of "syngas" derived from natural gas. New methods are now being developed to make it practical to use even CO₂ as a potential source of MeOH. This leads to what Olah and Prakash called the "Carbon Neutral Cycle." In a much cited 2009 article in the Journal of Organic Chemistry they illustrated this cycle as:



Olaf and Prakash argue that the many schemes to capture and sequester CO₂ are far from ideal. Rather than capture the CO₂ and try to “hide” it somewhere, the logical thing to do is to convert the captured CO₂ to another fuel – MeOH being the simplest approach. According to Olah and Prakash, new methods in C1 chemistry are now making this feasible. CO₂ can be reduced to not only MeOH but also Dimethylether (DME). DME has been found to be a very clean burning substitute for diesel fuel (see for example: <http://www.aboutdme.org/>).

In a recent Wall Street Journal opinion editorial (see: <http://think.usc.edu/2013/10/15/how-to-reduce-greenhouse-gases-and-make-money/>), Olaf called the Obama administration’s new proposals to reduce carbon dioxide emissions “expensive mandates and wasteful subsidies.” He warns that these policies “could send the U.S. economy into shock without making a significant dent in global emissions.” Olaf proposed that useful and targeted incentives should be used to push forward maturing MeOH technologies and infrastructure changes that would be needed to add MeOH to the list of viable fuel alternatives.

Olaf and Prakash are not the only proponents of MeOH as the fuel of the future. One of the best books on the subject is Energy Victory by Dr. Robert Zubrin. Dr. Zubrin makes compelling arguments in support of MeOH and other bio-derived fuels. He is not a rabid tree-hugger, but a thoughtful scientist and entrepreneur. He runs a company (Pioneer Energy in Lakewood, CO) that is engaged in developing Enhanced Oil Recovery (EOR) methods and additional industrial processes. In his book, Dr. Zubrin gives a balanced and thoughtful overview of Global Warming. He concludes that bio-derived fuels will be needed not in exclusion to, but in addition to fossil fuels. It is a fascinating and highly recommended read.

The establishment of MeOH as a viable alternative fuel could be facilitated by thoughtful and useful government policy (hope springs eternal). Among some of the areas where government could assist are:

1. Incentivize US car makers to make available high compression, small engines for efficient use of MeOH. Methanol has an octane rating of 100+. Hence it can be used with very high compression ratios. This enhances energy efficiency. One possible entry point is in motorcycle engines. Many “super-bikes” are already close to the right compression ratios. It is interesting that during the 1950’s, methanol/nitro-methane “street racer bikes” were pretty common. There’s not much of a technological barrier here. A little incentive would go a long way to seeing a return of “alcohol burners.”
2. Incentivize truck fleets to use MeOH and DME as extremely clean burning replacements for diesel fuel. These fuels contain no sulfur and burn with virtually no soot. There is no technological barrier with DME. It is being promoted widely by the International DME Association (see: <http://www.aboutdme.org/>) and SAE (see: http://www.sae.org/events/gim/presentations/2013/greszler_anthony.pdf). Even major oil companies are starting to show interest in DME (see the article by the

West Virginia Coal Association at:

<http://www.wvcoal.com/201103102693/Research-Development/conoco-converts-co2-to-methanol-and-dimethyl-ether.html>).

3. Incentivize continued research into conversion of bio-mass, wastes and especially CO₂ into MeOH and DME as preferred final products/intermediates.
4. Incentivize continued research in the use of MeOH and DME as fuels for internal combustion – piston and turbine. In some ways these fuels burn too cleanly. Because they are so low in soot they do not coat surfaces with carbon. Hence, metal parts can be subject to additional wear and attack by reactive combustion gases. There are many new metal technologies which can solve these problems (e.g. SiC coating of aluminum -- especially for low sulfur fuels) but targeted incentives could speed the deployment of these new techniques into the marketplace.
5. Continue support for [MeOH fuel cell](#) development. This still seems to be off in the future, but MeOH seems to have significant promise as a portable liquid fuel for use in transportation fuels cells. This has been one of the more fertile fields of work for Olah and Prakash.

On several occasions this Blog has also supported MeOH as a very viable contender for the “fuel of the future.” We have pointed out a number of interesting developments in the area of MeOH as an alternative fuel. One of the methods of great interest that we have been following and pursuing is the electrochemical reduction of CO₂ to MeOH. Significant strides are being made in this area. If you are interested in pursuing some of these emerging ideas please contact Ron Stites at ron@tek-dev.net

Perhaps MeOH is finally being “discovered.”

Bibliography:

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