



## Khosla and I Finally See Eye to Eye

Posted by [Robert Rapier](#) on February 20, 2008 - 11:00am

Topic: [Alternative energy](#)

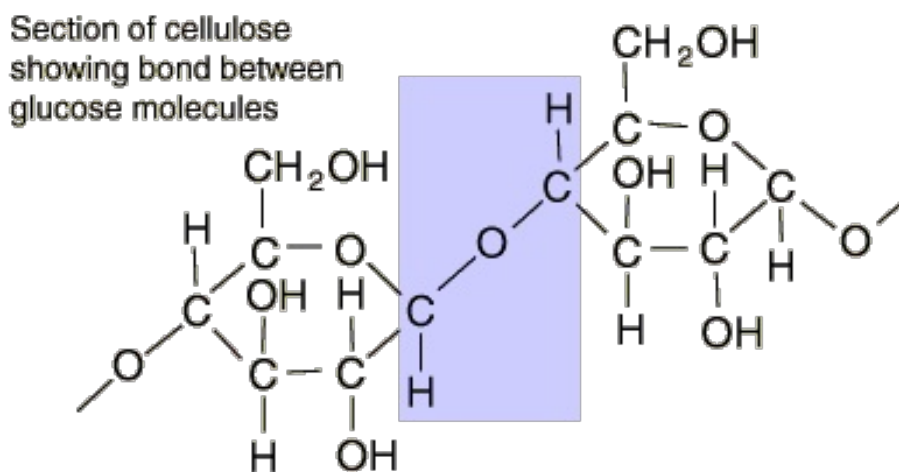
Tags: [cellulose](#), [cellulosic ethanol](#), [kerky](#), [ls9](#), [range fuels](#), [vinod khosla](#) [[list all tags](#)]

Some people think I am anti-ethanol. That is an oversimplification, and a misrepresentation of my position. I have nothing against ethanol as a fuel. It isn't as good a fuel as butanol, but then again we can't make butanol as efficiently as we make ethanol.

My objection is that I think the way we make ethanol in the U.S. is a big mistake, and we will recognize this eventually. It may happen following a drought in the Midwest that causes corn crops to fail. That may be what it takes before we recognize that recycling natural gas into ethanol via food was a terribly bad and short-sighted idea.

I also dislike the incredible hype associated with cellulosic ethanol. Promising too much lulls the public into thinking we have a solution ready to go in case of an energy crisis. Not so. But underneath that hype is a lot of potential. I don't think cellulosic success will come from an expensive hydrolysis/biological process. This is simply too inefficient, and requires very high fossil fuel inputs. Rather, I think success will come from a thermochemical process.

Lately, I have spent a great deal of time studying this:



On paper it is deceptively simply to turn that cellulose biopolymer chain into hydrocarbons or alcohols. In practice it is a different matter. If you know your organic chemistry, you can see sites that should be amenable to chemical attack. I have sketched out pathways that seem like they should work, but you never know until you take them into the lab and try them.

One of the things we do in oil refineries is to crack very complex molecules like this. So, for a long

time I have wondered about the implications of using various refining processes on cellulose. For instance, can it be cracked in a [hydrocracker](#)? How about a [catalytic cracker](#)? How would cellulose behave if co-fed into a [coker](#)? (There are obvious mass transfer constraints that would have to be addressed).

Imagine my surprise recently when I was trying to determine if anyone has ever done this, and I ran across this:

#### [Khosla Ventures and BIOeCON form KiOR to commercialize cellulosic ethanol](#)

A technology called the “Biomass Catalytic Cracking Process” could be the key to breaking material like wood, grass and corn husks down for ethanol production.

Catalytic cracking is a process already used in today’s petroleum refineries. Simply put, chemicals are used to break down complex organic molecules. The trick is making the reactions between specific chemicals and molecules efficient and controllable, in order to come up with a desirable product like cellulosic ethanol.

The biofuels industry is highly interested in that type of ethanol, but the process of “cracking” the molecular structures of woody plants, whether with chemicals, heat or other methods, has not yet become cost-effective. KiOR is Khosla Ventures’ and BIOeCON’s bet on commercializing a process.

Doh! Looks like I am not the only one who has been thinking hard about this. Clearly I need to stop letting these ideas percolate indefinitely in my head, and write up a business plan and get to work testing them.

I will be the first to admit that Khosla and I [haven't always seen eye to eye](#). But I think his most recent ventures - from [Range Fuels](#) to his investments into [LS9](#) to this latest venture - have a much greater chance of success than some of his earlier ethanol investments. Note that none of these processes require an energy intensive, wet-distillation, which has been one of my biggest complaints about ethanol production. I still say that he is overpromising on the potential, but I think he is now heading into more promising waters.

**NOTE: "rob@kior" dropped by and commented below that while the press release suggested they are making ethanol, they are actually making a biocrude.**



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