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Dear readers, welcome back to a new year full of exiting challenges in the world of green chemicals and fuels. I hope that you have had time to rest both body and soul over the holidays and that you are ready to digest a new issue of the Green Indicator. We are starting of this year with some thoughts on new green markets in the realm of consumer products and niche markets. We are also having a discussion on the automation of test procedures and we are starting of a new series of *the answer*, this time focusing on the public/private intersection. Please enjoy.

/ Christian Hulteberg

The Answer

Does the interest in green chemicals and fuels provide possibilities for interaction between industry and academia and do these possibilities in this case differ from other such cooperation's?

given by **Governmental Professor of Chemical Engineering, Hans Karlsson**, at LTH

Green chemicals, and some other highly prioritized areas have substantial possibilities of co-operation between the academia and private enterprises. Governmental funding, as provided by a "third party" tend to act as a catalysis for such co-operative projects. However, the mechanism or diving force is more complex than that.

As a professor with experience from employments in the private industry in Sweden and the US of America I have had the opportunity to follow the dynamics of private enterprises as well as the academia. Deregulation of the energy market in a certain geographic region has always had a backlog of half a decade until the utilities found out how to make the most profit out of the deregulation. When energy prices then got doubled or tripled in a short while, there became an inherent future prospective for green chemicals. Concurrently, governments tended to overtax the outage of energy, as a justification to provide funding to the development of green energy, as an option to "expensive" and "dirty" traditional fossil fuel alternatives.

Quite many of the areas in the academia (not only natural sciences and engineering) have some or a very strong focus on green chemicals and related problems. This focus has been boosted by funding provided by governmental agencies. This enigma has grown into an axiom of the need of the future society. Consequently, industrial focus on cooperative research has more and more given its attention on environmental issues, also of

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CatScan



Automation

This time in CatScan we would like to make a remark in the debate on highly automated discovery of catalysts. We are of the opinion that when these types of processes are highly automated, there is a chance that human creativity may be lost in the process. There are plenty of examples from history in which chance has led to discoveries such as nylon, LSD, vulcanization, penicillin and so on and so forth. The list can be made much longer and they all have one thing in common, the power of observation and deduction of man. It is our duty to make sure that there is still room for these types of observations in science today, even if everything goes towards higher degrees of automation. Please remember that even with automated test methods the chemical space is still vast and it takes creativity to be able to cut corners.

number of opportunities to find academic partners.

The concept "green" has become a label, but enterprises will, at the end, look at the bottom line under the consideration of legislation on environmental issues and safety. However, the public opinion, as "ruled" by the media, has always had the final word. Well, not always the bottom line. We still live in an interesting world.

Green niches

In the world of renewable chemicals, most companies are looking after initial market niches in which to launch products. These niches, if aimed at getting a green premium, should be targeted towards the consumers and not to other industry. In this text a few examples where there is room for green alternatives within the personal care market will be discussed and can perhaps inspire the development within this field.

The specialty surfactant market is more than \$600 million but out of this, only 10% of the surfactants available are of a natural origin. In this category, natural ingredients that do the same job as the synthetic, but with additional benefits such as reduced eye and skin irritation are highly preferable.

The same is true in the case of specialty emollients, the most widely used ingredient in personal care. The naturally derived products already have more than 50% of this market, but with an ever increasing demand for moisturizing, softening and anti-aging properties, there is a lot of room for more products. The same is true in the case of conditioning proteins, where more than 60% of the market is now made up of plant derived proteins. However, the botanic proteins suffer from higher costs and innovation in means of production to lower costs is a suitable challenge.

If the two former segments already are dominated by the naturally derived products, the same is not true in the case of hair fixative polymers found in hairsprays and other hair styling products. More than 99% of the products are derived from fossil based origin and are vinyl, acrylic and polyurethane polymers. One suggestion here may be to produce the same type of polymers that is currently used, but start from a renewable feedstock; if substitutes are difficult to come by.

Finally, it would be of great interest to find specialty active substances that not only provide the key desired property such as anti-aging, but also provides the effect of let's say an emulsion. In this case, the number of ingredients can be reduced and the product cost-of-production reduced. With these segments as an example, there is room for innovation in this field with regards to green products and since the market is in every way consumer oriented, there is good chance that a green premium can be reaped.



Author: Christian Hulteberg,
christian@hulteberg.com
+46 733 969420

Editor: Andreas Leveau,
andreas@hulteberg.com
+46 733 969423

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