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biobased performance materials

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Colophon

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Biobased Performance Materials programme

In the Biobased Performance Materials programme, knowledge institutions and businesses are working together on new bio-based plastics and application-focused research to improve the properties of existing bio-plastics. This will allow the bio-based materials to compete with fossil-based plastics, with regard to material characteristics and price. The bio-based plastics can be applied in plastic bottles, household equipment, train -, plane - and car parts, computer housing, paint, floor coverings and packaging materials. The programme is coordinated by Wageningen UR Food & Biobased Research and is co-financed by the Dutch Ministry of Economic Affairs, Agriculture and Innovation.

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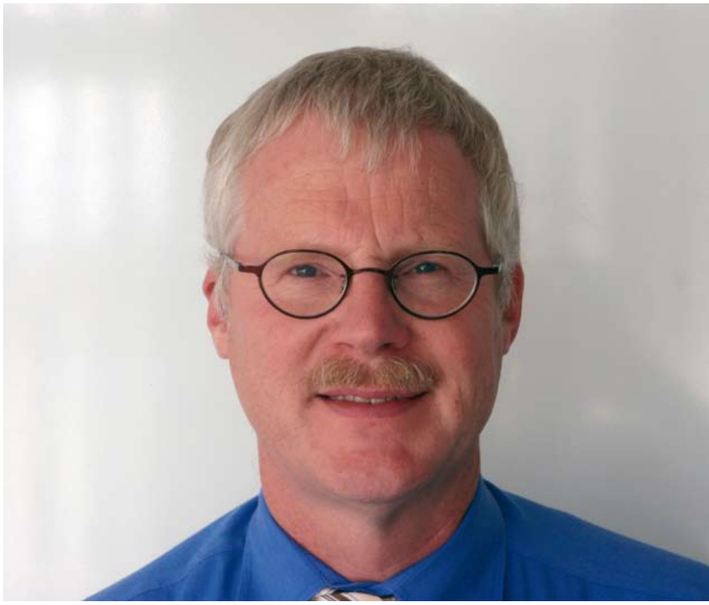
Picking up momentum



Let me cut to the chase: the start-up of the Biobased Performance Materials (BPM) programme was not easy. It took us a year to get up to speed, a year we could have spent more effectively. Luckily, now that we are doing it, it proves to have been more than worth the trouble.
The most important reason for the slow start was that companies had to get used to the cooperation. In large companies, this mainly consisted of legal hair splitting. They are used to working with research institutions on a one-on-one basis, but not in larger groups, together with other companies. This led to hassle at the legal departments regarding the rights and any patents - hassle that led to months of delays.
In smaller companies, there was a different issue. One of the planned projects even had to be cancelled because the partners were worried they would be helping the competition by cooperating in the research. I think these worries were unfounded. As a company, you usually stand to gain from it, when others are involved in comparable innovations. You can't begrudge each other all success; there is enough to go round for everyone. Anyhow, we were unable to convince them of this, and in the end, we had to cancel one project.
All in all, a slow start. The last year has shown that the trouble it has cost to bring together the various parties has been more than worth the investment of time. Together, you know a lot more than on your own. I attended meetings of HIPLA, a project where we are looking for new applications for High Impact PLA (polylactic acid), and they were fantastic. I found it really thrilling to see how much expertise there was to be found at one table. It was a real pleasure.
We now work with more than 30 mainly medium-large or small companies on innovation. The existing schemes, BE-Basic and CatchBio are predominantly aimed at big companies. For SMEs, where the real innovation has to come from, there were not many programmes yet. BPM fills that gap.
Entrepreneurs sometimes criticise the government, but in this case the Dutch government deserves the highest praise. Without stimulation from the government, this programme would never have come about. The Ministry of Economic Affairs, Agriculture and Innovation has a clear vision, which it carries out with passion. I am pleased we will probably be given the opportunity for a new round for Biobased Performance Materials. The first round has proven that cooperation pays off.

Jan Noordegraaf,
member of steering committee BPM; on behalf of the industry

Suddenly everyone was green

Hans Ridderikhoff at Croda saw it happen right before his eyes; the greening of the chemical industry. In 2006 on an exhibition, the stands around him were suddenly all green. ‘This made me think: we are probably much greener than those competitors, so we should show this.’

For a long time, bio-plastic was the sandal-wearing cousin of real chemistry. Bio-based materials were something for the margin, great for in the organic shop, or a business gift, but they were not a serious alternative for materials made from oil. Harriëtte Bos was pleased to see this attitude gradually change. ‘The other day, sitting on a train, I heard someone shout something in public in his mobile phone about the bio-based economy. Ten years ago that would have been unimaginable.’

Bos has been working on bio-plastics at Wageningen since 1994. Before this, she worked on polymers for DSM. Her colleagues at the time looked at her transition to Wageningen with pity. They thought bio-plastics were not worthy of the name plastic. Bos quietly agreed with them, in parts. ‘Starch plastics were not a very worthy alternative to what we were able to do with oil. For a long time, I too was very sceptical about the possibility of a really wide use of bio-based products. There were dashboards with natural fibres, which was great, but we could already do so much more with polymer technology. Bio-based would not come near that any time soon.’

The possibilities of making good materials from starch improved steadily, but bio remained in the realms of niche products. Biodegradable flowerpots, for example, which horticulturalists could just dispose of with their waste. Or clamps to seal the intestines of pigs when they are slaughtered, which - more practically than in ordinary plastic - you do not have to dig out of the slaughter waste before processing it into animal feed. The chunk of starch can end up in the bowl of dog food, without problem.

‘We are still conducting research into the improvement of starch products. In certain applications, there is a wide range of new options.’ But the big breakthrough for renewable materials will not come from starch alone, Bos thinks. It will come from another track, namely by starting to see biomass in the same way as oil. Just like oil is a mix of hydrocarbons, biomass is also a mush of chemical substances. By taking these apart and cutting them into building blocks, you can start building polymers in the same way as you make materials from oil. A number of projects within BPM is focusing on this track.

“Bio-materials light a fire under polymer technologists”

From bio-based origin

Chemical giant, Dupont, was one of the first large chemical companies to show that bio-based does not have to be solely based on good intentions, but also on cold economic logic. For a few years now, Dupont has been making 1,3 propanediol from sugar instead of oil. This raw material for the plastic PTT has two alcohol groups. Making the substance from oil costs a relatively large amount of energy. Propanediol from oil is made via ethylene, which then forms the basis for the production of propanediol. Glucose is a better starting material. It already contains the alcohol groups and can be converted into propanediol via fermentation. ‘Dupont claims the process consumes 40% less energy than production from oil. I presume Dupont earns a greater margin on bio-propanediol, but it could also be that they are investing in bio-based materials for strategic purposes. Betting on several horses is safer. The prices of sugar are more stable than those of oil.’

Dupont is certainly not the only one to produce building blocks on the basis of bio-based products.

Solvay produces epichlorohydrin from glycerol. And the French company Arkema earns thirty per cent of its turnover in technical polymers with materials of bio-based origin and invests two thirds of its research budget in the development of renewable materials.
Bio-materials have provided a new sense of fervour among polymer technologists. ‘From the early nineties, there was sense of there being less left to discover. The five existing big plastics allowed us to make all applications. Research was aimed at small improvements; large innovations or new materials were no more to be expected. But now, we are involved again in completely new routes.’

“Greening of chemical sector will increase in the next years”

Everyone green

Hans Ridderikhoff, R&D manager at the multinational Croda, saw the green revolution in chemistry happen right before his eyes at a trade fair in Germany. ‘In 2006 I suddenly noticed that all the stands around were green. A lot of images of nature. ‘This made me think: we are probably much greener than those competitors, so we should show this.’
Croda is a chemical company with bio-based DNA. The British parent company was founded in 1925, producing lubricants from the wool fat of sheep. Ridderikhoff: ‘We still do this, by the way.’ The Gouda plant started from the local candle factory. Candles used to be made mainly from animal fats. ‘We have been working with bio-based raw materials for a very long time.’
Croda now produces dimerised fatty acids in Gouda. By allowing two unsaturated fatty acids to react, you get larger molecules with two acid groups. In recent years, Croda developed techniques to replace these acid groups with alcohol groups and amides. The resulting substances have special characteristics and are used in the production of paint for ships, glues and resins, for example. They are all of bio-based origin.
Ridderikhoff expects the greening of the chemical industry to continue in the future. ‘Raw materials from the petro-chemical industry will be replaced by biological alternatives, for example, bio-methanol and propane glycol. But you will also start seeing increasing numbers of products which are actually based on bio-based routes. Materials with new characteristics. This is the track we are following.’

Footprint

The green image from bio-based products is the most important motivation for companies to invest in them, according to Ridderikhoff. ‘In the end, it is important to show that the footprint really is reduced. We are now able to prove this from cradle to gate. We can use figures to support the view that bio-based really does significantly reduce the impact on the planet, unless the production has a large impact on land use. If you have to chop down a big chunk of the rainforest to produce palm oil, you are better off using oil. But if you are able to use products from European agriculture for example, this is a much better option.’
It is more difficult to ascertain whether this environmental advantage also exists when the entire life-span of products is taken into account. This also depends on their life cycle or other qualities. ‘If new products last half as long, the profit quickly disappears.’
In recent years, Cor Koning has moved back and forth between industry and academia. Between 1987 and 2000 he was employed as a polymer technologist at DSM. After this, he departed for Eindhoven University of Technology to become a professor, and recently, he has started to combine these two jobs. ‘I am in Eindhoven a few days a week to mentor a number of PhD students’, the rest of his time is spent working in Zwolle on the development of coatings for DSM.

Harriëtte Bos: ‘We have to start seeing biomass as oil, a mush of chemical substances.’

Hans Ridderikhoff: ‘The greening in the chemical sector will increase in the next years.’

He too, saw the tide change. ‘In the late nineties I was involved in the development of a new polyamide. It was superior to Nylon 6 or 66, which is used nowadays, and three-quarters of it is based on renewable raw material from castor oil.’ DSM nevertheless did not launch the product. The marketeers of the company thought there was no room for a new plastic, and the green raw materials were not yet a sales advantage. Koning: ‘Now they have come back on that decision, and will start production.’
In the meantime, bio-based has become an added value. Every chemical company now wants to have at least a number of green products in its portfolio, says Koning. ‘Customers ask for it. Nokia and Apple, for example, also want to know that the raw materials did not come from food crops. What is great about the green products is that some are actually superior to petrochemical alternatives. A PhD student of mine, for example, has developed a powder coating on the basis of starch or cellulose. It is of equivalent quality for most parameters, and is actually superior in one aspect - it discolours less under the influence of sunlight.’

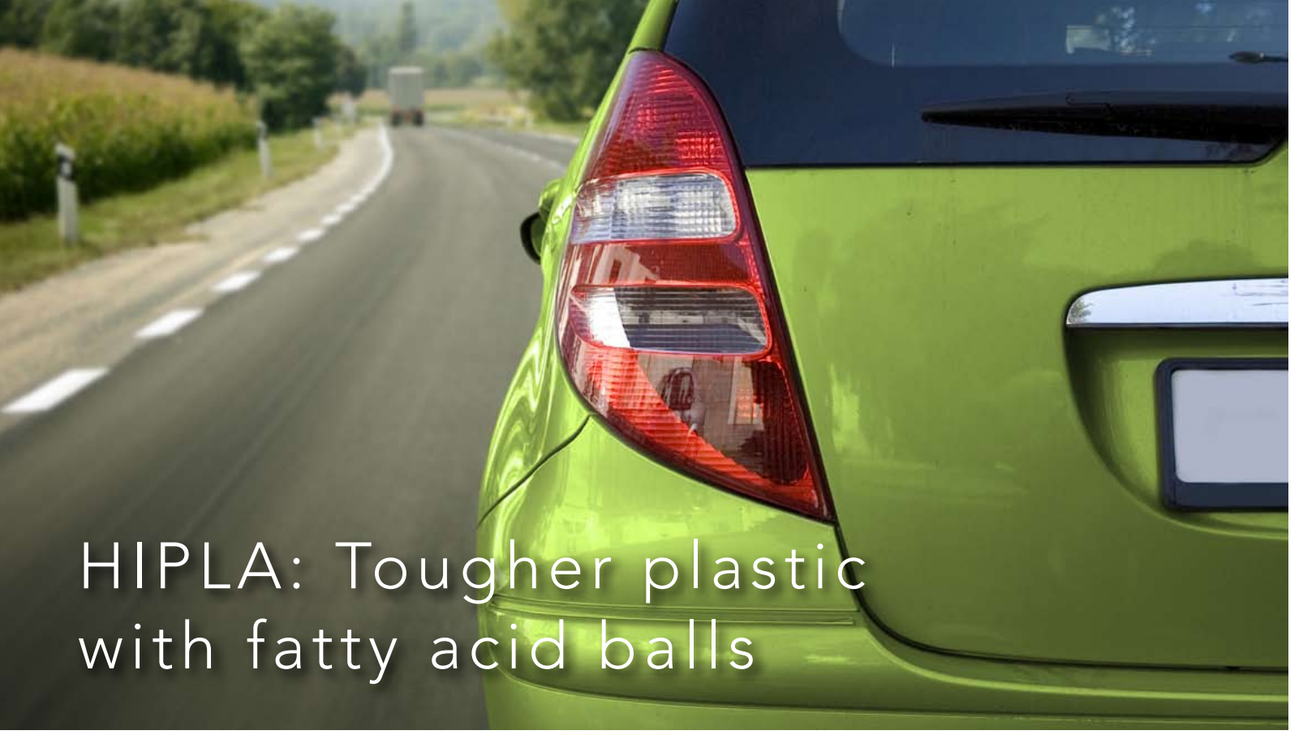
Oil price

Astonishing really, at the end of the nineties, anyone could calculate that oil would run out one day. Why were companies hardly interested in bio-based back then, and five years later that has shifted completely? Koning: ‘That is hard to say. I think geo-political considerations also played a role.’ The world seemed a lot more stable in the ‘90s than in the decade afterwards, with 9/11, the invasion of Iraq and an oil price which rose sky-high due to the economic growth in China and India. ‘Companies want to be less dependent on the oil price.’
According to the polymer technologist, chemical companies have a great deal of alternative plastics based on biological raw materials in their filing cabinets. Alternatives which can be produced in the current factories. It is a matter of waiting for competitive prices, because there are clients who are happy to pay a few Euros more for a green image, but for many customers from the chemical industry, price is the number one consideration. ‘If the oil price increases quickly, or the price of biological alternatives drops, the shift can happen very suddenly.’

“The Netherlands can be a pioneer in the transition to bio-based materials”

Researcher Bos at Wageningen UR Food & Biobased Research expects that the Netherlands is able to play a leading role in the transfer to bio-based materials. ‘The Netherlands always played a leading role in the development of new polymers. We have large chemical companies, and among others the universities of Groningen and Eindhoven have leading research groups in the area of polymer chemistry. In agriculture, the Netherlands also leads the world. The industry is economically strong, and in Wageningen, we have a good reputation with regards to research. Combined, this offers a strong foundation for bio-based materials.’

Cor Koning: ‘There is now room for new bio-based plastics.’



HIPLA: Tougher plastic with fatty acid balls

‘We are looking for ways to improve the impact strength of PLA plastics. This is needed for car bumpers and for the casing around your laptop or phone, for example’, says researcher Rutger Knoop.

Plastic made of polylactic acid (PLA) is in itself brittle; it breaks easily. This is a serious disadvantage for many applications, such as laptops or car bumpers. In the HIPLA project, researchers are attempting to make the bio-plastic tougher, so it can withstand higher impact loading and is suitable for more applications. They are investigating fatty acid derivatives for this purpose, with rubber-like characteristics. ‘We are trying to incorporate these in the PLA’, says Knoop.

The plastic does indeed become tougher by using the dimeric fatty acids, Knoops observed. ‘The particles work as a sort of car tyre in the PLA, as impact absorbers. The idea works in principle.’ Impact measurements have to show the exact impact resistance. The plastic does have to remain crystalline for the retention of heat resistance. ‘PLA now retains its shape up to about sixty, seventy degrees. If it gets any hotter, it changes shape. That is not practical when you want to make a dashboard which might sit in the sunshine.’

When manufacturing tough PLA, good mixing is essential. If it is not mixed well, the plastic will become white instead of transparent. The final product should be manufactured with the current machines and processing methods. ‘For white plastic, talcum powder is currently added. The processing of fatty acids has to be just as simple’, Knoop says.

Project partners: Apeldoorn Flexible Packaging Croda • Food & Biobased Research • HSV • Synbra

BIOCRES: Human-friendly composite resin

A bio-based composite resin, without the toxic styrene. This is the challenge for the researchers in the BIOCRES project.

‘We are looking for two things in this project’, says Rolf Blaauw. ‘A polyester resin from renewable raw materials instead of oil plus a replacement for styrene, which is also made out of oil.’

Composite resin is applied in wind turbines, cars, train noses, surf boards and canoes. Styrene is used to dissolve the resin before the production of the composite, and in addition to this, it reacts with the resin to form a hard and tough material. However, during processing, a small part of the styrene evaporates, which poses a health problem. Next to the general wish to develop renewable materials, this is another reason for developing an alternative for styrene.

Blaauw foresees that the first aim, a polyester resin from biomass, will succeed. ‘The building blocks will come from sugars. We are currently still working with starch and sugars from the edible parts of plants, but in the future these can also be produced from non-edible parts, from lignocellulose.’

Finding a replacement for styrene is a greater challenge. The chemical industry has been searching for this for a long time. ‘One of the problems is that styrene is very cheap, and it is difficult to find something with the right characteristics which is just as cheap.’ They may find alternatives in vegetable oils. ‘We are testing candidate molecules on the reaction with their counterparts in the resin.’

What is special about BIOCRES according to Blaauw is that there is cooperation between companies across the whole production chain, from raw material producers to producers of the final product. ‘This is how we arrived at the candidates for the replacement of styrene.’ The participating end manufacturer also manufactures the red and white ANWB (the Dutch automobile association) signposts, largely from bio-based materials. ‘It would be great if these could soon be completely manufactured from bio-based materials’, Blaauw decides.

Project partners: Calendula Oil • Cargill • Cosun Food & Biobased Research • NPSP Composieten Nuplex • University of Groningen

MOBIOSOL: Haute cuisine with monomers

‘We want to find out whether we can make good polymers from new monomers for technical plastics and coatings’, Daan van Es says about the MOBIOSOL project. The building blocks come from vegetable oils and fats and from sugars.

Van Es and his colleagues work with new building blocks, which are produced by two companies in the project, and with building blocks they have developed themselves. Depending on how and in what ratio the building blocks or monomers are mixed, you will get materials with different characteristics, Van Es explains. ‘On one hand, we are looking for strong polymers – polyesters and polyesteramides - which are resistant to high temperatures, for technical plastics used in construction materials, electronics and car parts for example, and which are often processed at high temperatures. On the other hand, we are looking for polymers for coatings, which combine well with pigments and which behave well in water, or melt at low temperatures.’

Polymers are usually made in a melt: heating them for a long time connects as many monomers as possible to create the largest and strongest possible polymer. ‘However, not all bio-based building blocks can endure high temperatures or prolonged heating’, says Van Es. ‘This is why we are testing a method which is similar to braising meat: relatively short at a rather high temperature, which creates shorter polymers, after which, we keep cooking at a lower heat by means of so-called solid phase post-condensation.’ The researchers are also investigating whether the characteristics of various compositions can be predicted on the basis of results with the current mixtures of monomers.

Project partners: Avantium • Croda • DSM Food & Biobased Research • TU Eindhoven

NOPANIC: Industrial coatings from fatty acids and sugars

Researchers in the NOPANIC project are attempting to make polymers using building blocks from fatty acids and sugars for powder- and water-based coatings for industrial use. The work focuses on polyamides and polyurethanes.

Powder coatings are applied at room temperature, after which they are cured at a high temperature. ‘This is why we are looking for polymers which are glassy and do not have a crystalline structure’, says Bart Noordover. ‘The polymer must also have reactive end groups for the chemical reaction during the heating and curing, where all chains are linked together to form a polymer network. Checking the type of end groups is our second aim.’

Specifically for the water-based coatings, the polymers must be dispersible in water: the polymer particles must remain separate from each other in water and must not glue together. ‘Normally you add a surface-active substance to the mix, but this may have a negative effect on the characteristics of the coating’, explains Noordover. ‘We therefore want to implement a functional group in the polymers which will stabilise the polymer chain in water. This principle is known from other types of polymer dispersions, but not for the polymers we work with. We are also going to test candidates of bio-based origin for this purpose.’

The researchers are also trying to make the polymers colourless, so they can be pigmented with colours.

At the end of the project, the polymers have to be described in detail, from molecular mass and chemical structure up to the thermal stability, and the new powder coatings and water-based systems have to be tested by the end users. Noordover: ‘The participating companies must be able to apply the technology immediately.’

Project partners: AkzoNobel • Croda • Food & Biobased Research • Nuplex • TU Eindhoven Universiteit Utrecht • Ursa Paint

ChitoSmart: Plastic that keeps food fresh for longer

A compound found in the shell of shellfish or mushrooms could provide film packaging with anti-bacterial properties. In the ChitoSmart project researchers are working on this type of packaging material for food products.

Chitin is the name of the compound which can be sourced from the shells of crabs and shrimps. But it can just as easily be harvested from mushrooms and other fungi or from biomass left over after fermentation. ‘We work with a derivative of chitin, chitosan, which is a polysaccharide with glucosamine as its most important component’, Carmen Boeriu explains. What makes chitosan attractive is that it kills bacteria and mould. ‘This makes it interesting to apply in packaging, but you could also use it in wound creams for example.’

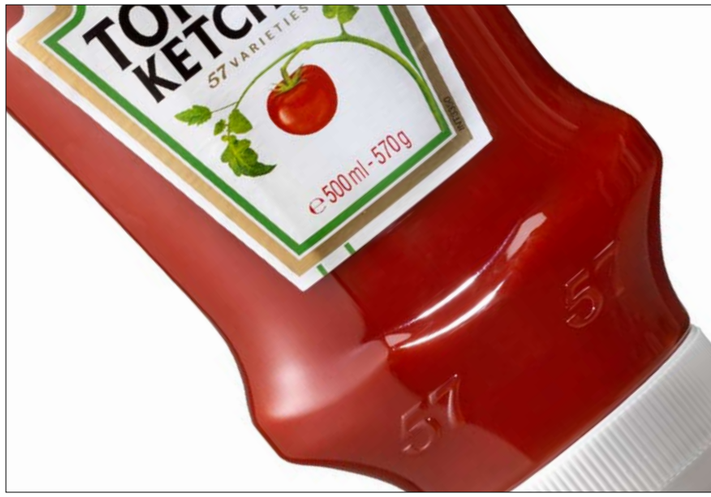
The ChitoSmart project initially focuses on the development of packaging material which prevents the decomposition of food products. This requires research in different areas, Boeriu says. ‘For example, we would like to find out more about the working of the antimicrobial effect. Little is known about this. The theory is that when surface contact occurs, chitosan affects the cell wall of bacteria in such a way that the bacterium dies - they are positively charged polymers. If we find out more about the mechanism, we can start optimising the polymer, and thereby use it more effectively in products.’

A second tact starts with the mapping out of the bacteria and mould involved with decomposition. ‘We will then look at how chitosan works against these fungi and bacteria, and whether we can enhance this antimicrobial effect by making alterations to the chitosan.’

A third challenge will be the effective processing of the chitosan in the packaging material. ‘We can see the antimicrobial effect in the lab, but it has never been sold in a product. This is going to be exciting’, says Boeriu. The intention is to process the chitosan derivatives in the plastic polymers. ‘This means they stay in that matrix, and do not soak into the food products. It concerns surface contact, after all. Bacteria and fungi are also on that surface.’ After applying it in food products, the researchers see wider applications towards the medical sector and cosmetics, in plasters and healing creams.

In addition to the researchers of Food & Biobased Research and TNO, three companies are participating in the project: Nippon Suisan, which produces chitin and chitosan from shellfish and provides added value to waste, food company Heinz, which is interested in better packaging that guarantees good storage of a product for longer, also after opening, and packaging company AFP. This company mostly focuses on food packaging. ‘Our clients who pre-cut and package cheese and sausage now have a very dense distribution network in order to guarantee freshness as effectively as possible’ says Eddy Hilbrink, head of research and development at AFP. ‘Shelf life, particularly of fresh produce, is partly determined by the potential growth of fungi. An antibacterial film provides my clients with more options and reach. Longer shelf life also reduces the risk of consumers throwing away food.’ As it is an underlying problem, Hilbrink describes his company’s participation in the project as a gamble. ‘But I try to look ahead.’

Project partners: Apeldoorn Flexible Packaging • Food & Biobased Research • Heinz • Nippon Suisan • TNO



PLAstic Bottle: A better bottle made from renewable plastic

A plastic bottle made completely of polylactic acid (PLA) is not yet suitable for carbonated soft drinks and juices. Fizzy drinks release carbon dioxide and juices only have a very limited shelf life, if the gas barrier is too low. In the PLAstic Bottle project, researchers are therefore working on a less permeable PLA plastic.

The fact that PLA is permeable to gasses such as oxygen, carbon dioxide and vapour is due to the chemical structure and morphology of the PLA, researcher Denka Hristova-Bogaerds explains. 'This is why we are trying to change the morphology.' You can imagine the polylactic acid polymers as a plate of spaghetti. When you orient the spaghetti strands, they will form a pattern which ensures they form crystals more easily. How the patterns are formed depends on the length of the polymer chains, the temperature, the draw ratio and the draw direction. The aim is to reshape or reinforce PLA in such a way that it becomes more crystalline and thus reaches better barrier characteristics. The bottle does have to remain as transparent as possible. If you do not have the draw and crystallisation under control, you will not achieve the required characteristics; you might pull holes in the material for example. Researchers have created simulations of the production of a plastic bottle to allow the shaping of a PLA-plastic bottle to be studied in more detail.

The researchers also use different types of PLA. Lactic acid has a D and an L shape. One hundred per cent L lactic acid (PLLA) is able to crystallise more and more quickly than PLA which also contains D isomers. The first prototype bottles have now been developed, Hristova-Bogaerds reports. 'We are now improving the process and method in order to achieve a PLA bottle with a superior performance.'

Project partners: Constar • Croda • Desch Plantpak Food & Biobased Research • FKuR Kunststoff Purac • RedOrange Food • Synbra • TU Eindhoven

ACTION: Bulk chemicals from plant residues and sugars

Bulk chemicals, such as styrene and acrylic acid, can also be made from biomass. In the ACTION project, researchers investigate step-by-step how to do this, for the benefit of and in cooperation with the industry.

Styrene and acrylic acid are amongst the most used bulk chemicals in the world. They are used to make polymers -polystyrene and acrylates, respectively- and are currently still made from fossil raw materials. Polystyrene is used in plastic packaging, coffee cups, insulation foam, coatings and glues, and acrylates in Plexiglas and optical fibres. In ACTION, the researchers focus on finding ways to get from biomass to styrene and acrylic monomers. 'All the separate steps to create styrene and acrylates from biomass are known, and now we are putting all these steps in sequence', researcher Jérôme Le Nôtre explains.

The basic material for styrene comes from side products from bio-ethanol production. These sometimes contain up to 35 per cent proteins. These can be used as animal feed, but not all amino acids - which proteins are made of - are needed for this. Some of these amino acids can be isolated and used for other purposes. In this project, researchers turn them into styrene, with enzymes and a chemical reaction using a catalyst. In a separate part of the project they make acrylic acid, in two steps, using a chemical substance from generally available fermentable sugars.

'We also investigate whether the manufacture of styrene and acrylates can be done more efficiently and cheaper, using different enzymes or chemicals', says Le Nôtre. As similar techniques are already applied on a large scale, the industry can quickly scale up the process, once the project is completed, Le Nôtre expects.

Project partners: BASF • DSM • Food & Biobased Research • GreenICT • Synbra • Wageningen University

FEASIBLE: Fairer comparing of plastics

How sustainable are bio-plastics, and how feasible is it to use them to replace regular plastics. This is explored in the FEASIBLE project, in which potential end users of renewable plastics and manufacturers of bio-plastics cooperate.

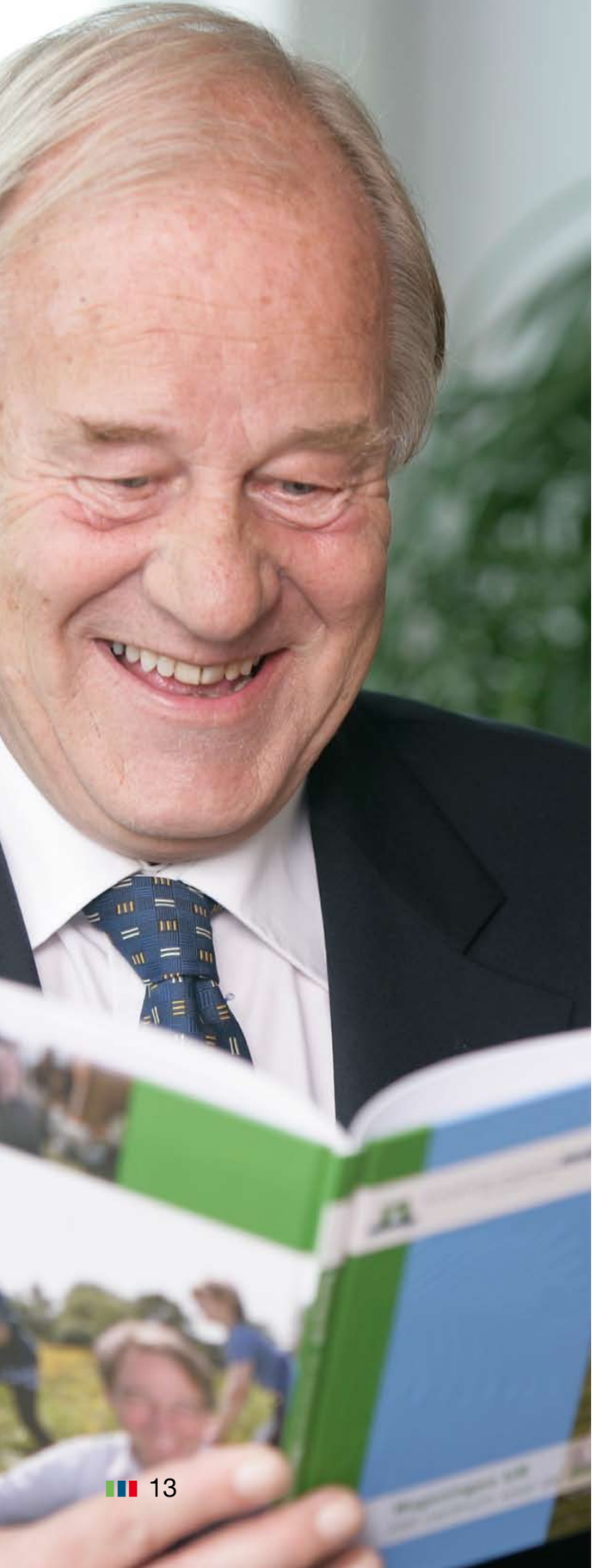
The exact characteristics of many bio-based plastics are not yet known. In various publications you will often find opposing data, which occurs for instance because they were measured using different methods. In FEASIBLE, researchers try to rectify this for a number of bio-plastics in particular applications: plastics for injection moulding applications, for bottles, foils and carpet backing. Bio-based plastics studied in the project are either commercially available or in development by companies which participate in the BPM programme. 'We are going to make profiles for these bio-plastics on the basis of their characteristics. We produce test samples which we use to carry out a wide range of tests, so we are certain everything is measured in the same way', says Harriëtte Bos, who is involved in the research.

The researchers are also going to make life cycle analyses of the bio-plastics. This allows the bio-plastics to be compared among each other, and also allows renewable plastics to be compared to traditional oil-based plastics. This aspect was an important reason to participate for the producers of plastics and companies which use plastics in their products. If they choose for renewable plastics, they want to be able to prove the positive aspects of their choices. This research has to provide the knowledge for this.

However, existing LCAs are not sufficient for bio-based products. Researchers are therefore working on a better set up of the analysis, within the project. 'The step towards renewable raw materials can lead to indirect changes in the use of land, for example', researcher Martin Patel explains. And there are more issues that are not yet included in the LCA methodology'.

In addition to this, bio-plastics sometimes have slightly different properties compared to plastics made from oil. This is why the researchers want to implement a way to compare conventional and renewable plastics in the LCA. Instead of only looking at kilos of product, attention should also be paid to the functionality of the plastic in a product. 'If the bio-plastic is stronger than the conventional plastic it replaces, the part could perhaps be made thinner. This has a positive impact on the LCA and the cost price. On the other hand a bio-plastic which is weaker, requiring more material, may still be better for the environment if its overall environmental profile is better than for the oil based alternative ', concludes Bos.

Project partners: ABB • Ahold • Croda Food & Biobased Research • Heinz • HSV Jus de Pommes Meneba • NatureWorks • NPSP Composieten • Océ Purac • Rinos • Rodenburg Synbra • Utrecht University



The bio-based ambition of the Netherlands

‘The bio-based economy has been growing strongly for the last 10 to 15 years. In countries such as China, the US, Canada and European countries, the focus lies on new research. This indicates that the development is going to be massive. It is therefore important to see what role the Netherlands can play in this.’
This is what Roel Bol says, director of the Biobased Economy programme department of the Ministry of Economic Affairs, Agriculture and Innovation (EL&I). He clearly sees opportunities for the Netherlands. ‘Due to our unique combination of a strong agricultural and chemical sector, logistics and a solid knowledge infrastructure, research and product development for a bio-based economy could provide us with a great deal of employment and knowledge development. We can gain a leading position in the world, in the bio-based economy. In the policy of Minister Maxime Verhagen of the Ministry of EL&I, the bio-based economy plays an important role.’ The government has the ambition to push the Netherlands into the top three in the world in the field of bio-based economy, and to become the gateway to Europe for bio-based raw materials.

Roel Bol, director of the Biobased Economy programme, Ministry of Economic Affairs, Agriculture and Innovation

What is being done to realise this bio-based ambition?
‘To start with, the interdepartmental programme department, which was installed in 2009, is expanding. In addition to this, in the new Top-sector policy of our Ministry bio-based is clearly an important cross-sectoral theme. Under the wings of the top sector, Chemistry, we are now working towards an inter-sectorial business plan, with coherent activities in the area of research and development. Greening of the economy plays a role in many top sectors. In Agro & food, for example, work is carried out on improved utilisation of side streams, in horticulture on value-added components and algae. Logistics are important: how do you get streams which are sometimes large in size, efficiently through the chain. In the Chemistry sector, they are looking for replacements of oil and gas, and the Energy sector looks at the additives from biomass before burning it. Water looks at biomass production in aquatic systems, Life Sciences looks at the biotech for pharma, biomass and industry, and High-tech also includes a range of overlaps. Even the Creative top sector wanted to come for a meeting recently.’

Who are participating?
‘We are working on a dialogue across society. At the end of September, the bio-based economy manifesto was signed in Delft, which was developed from a process together with social stakeholders. Among the signatories are chemical and paper companies, energy companies, the marketing boards for crop farming and horticulture, and for example Natuurmonumenten, Oxfam Novib, and Stichting Natuur en Milieu. The manifesto provides the outlines and shared guiding principles for an economy based on the use of renewable raw materials. It includes the principle that a bio-based economy must never be at the expense of food provision. As programme management, we facilitated this process, impartially. This is because it is important that the commercial sector and social stakeholders discuss among themselves who takes responsibility for what. We also noted that existing legislation and regulation can stop innovation. This is because legislation is always based on the past. We are trying to resolve these bottlenecks. This can be done by implementing new developments in existing laws or rules, or by updating the rules. This may sometimes take a long time, because a great deal of legislation and regulation has been set down in a European context. For example, European import tariffs on green raw materials for the chemical industry.’

What else would you wish from Europe?
‘We would like the European Commission to start stimulating the bio-based economy in the EU member states by means of public-private cooperation agreements. Regarding agro, bio-based and food security, this could involve a sum of 4.5 billion Euros. In addition to this, we also argue for a coordinated approach; an all-round European policy.
Outside Europe we are looking at potential bilateral cooperations. In this regard, I see good opportunities for cooperation in Brazil, Malaysia, the United States, Canada, Russia and the Ukraine.’

What is the budget for the support of desirable bio-based developments?
‘The developments in the Netherlands are financially supported in various ways. 500 million has been made available for the stimulation fund. The R&D tax deduction is converted from a subsidy, to a tax measure, the RDA+: if you invest in research and development, you can deduct extra tax. This also involves half a billion. In addition to this, in the Top-sector policy 1.5 billion is redistributed, in times of cuts there is little extra budget. This redistribution may also lead to more resources for the bio-based economy. In addition to this, various provincial governments stimulate bio-based developments, particularly those which have a less tight budget, such as Brabant and Zeeland.
What struck me as a positive aspect of the BPM programme, is that so many companies are involved. This shows that the commercial sector is clearly focused on bio-based developments, and that it is an attractive programme. There is always a question of whether resources have been used correctly, but there is clearly a great deal of commitment surrounding BPM. This is a great instrument to stimulate developments.’

biobased performance materials

Spotlight....

Participating

The Biobased Performance Materials programme is more than the research projects which you can read about in this magazine. In addition to these projects we also work on the development and application of new bio-based materials in other ways. We want to show that bio-based materials already offer a great deal of opportunities, and that these opportunities only continue to grow in the future.

We do this by organising symposia, for example, where we bring together scientists from research institutions with representatives of companies. For the building and construction sector, we are writing a book with an overview of bio-based construction materials which are already available to buy. We develop lesson material for students of plastics technology, and through the publication 'Biobased plastics 2012', we provide an overview of the current state of the art in the area of bio-based plastics.

The formula to allow research institutions and companies to work together on practical innovations has drawn a great deal of attention, and fits in well with the Top-sector policy of the Dutch government. This is why we are going to expand the BPM programme. We are happy to do this with our current partners, but we are also extending a warm invitation to participate to new partners. In the so-called second call, we plan to set up approximately 20 projects in partnership with business. If you have an idea for a research project, or would like to work with one of the BPM partners, do not hesitate to contact us.

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