## NEW RECIPE FOR TOUGHER PLA PLASTIC

# Coming soon: bioplastics in car bumpers

**Dutch consumers are familiar with bioplastics in the form of the crinkly packaging around their organic bell peppers. Rutger Knoop is working with chemical company Croda on a new generation of biodegradable plastics – not to end up in the organic waste bin but in laptops and car bumpers.**

**TEXT** KORNÉ VERSLUIS **PHOTOGRAPHY** MICHIEL VAN NIEUWKERK

Polylactide (PLA) is one of the most promising of biodegradable plastics and can be processed into a wide range of products, from packaging material to polystyrene foam. It cannot yet compete with oil-derived plastics, however. 'It is too brittle and that limits its potential', says Rutger Knoop of Wageningen UR Food & Biobased Research. 'I am looking for ways of making PLA tougher so that it can also be used to make laptops and car bumpers.' Two years ago, the Dutch ministry of Agriculture, Nature and Food Quality put eight million euros into a collaboration programme in which research institutes and companies embarked together on a search for more broadly functional bioplastics – known as Biobased Performance Materials. Researchers from Wageningen UR and other universities are now working with companies on such topics as organic artificial gum, car varnish and materials for windmills and reusable bottles. One of these projects is High Impact PLA (HIPLA), in which Knoop will be working with chemical company Croda and other partners on additives that make polylactide less brittle. The other partners involved are HSV Technical Moulded Parts, Apeldoorn Flexible Packaging and Synbra Technology. Croda is an originally British company that started out producing ingredients for cosmetics, among other things. The company's first product was lanolin, a fat from sheep's wool. Its Dutch branch is in Gouda and grew out of the local candle factory, which also processed fats and vegetable oils. Candles are no longer produced in Gouda, but the company still processes vegetable oils, using natural raw materials to produce a range of substances for paints and ink, fabric softeners and additives for plastics. HIPLA aims to find an additive that will make polylactides tougher.

### PRAGMATIC APPROACH

Knoop studied chemistry at Groningen University and obtained a PhD on polymers in Eindhoven. He has been working at Food & Biobased Research for two years. 'It was strange at first. The main difference is that

Hans Ridderikhoff (Croda) and Rutger Knoop (Wageningen UR).

when you do pure fundamental research you try and control the conditions as fully as possible. Here there is a much more pragmatic approach. Some time ago I had a great idea for making flexible cellulose fibres, but my colleagues immediately said, 'sounds wonderful but you can forget it. In practice it is impossible to make those flexible fibres.' It is the same story with the fatty acids at Croda. I was used to working with precisely defined substances. Croda says, 'That is not practical, but we can deliver a mixture guaranteed to have characteristic A and B.' You don't get into the scientific journal *Nature* like that, but it is nice to work on something that will be in the shops in a couple of years' time.'

Hans Ridderikhoff is manager of three research teams at Croda. He keeps in touch with Knoop. 'Of course we hope the project will develop interesting new techniques and procedures that will lead to new products for us.' The research group that Knoop belongs to provides him with 'a nice bridge between the university world and the business world'. Knoop: 'University researchers are primarily out for a nice publication, but that is not what interests us. The group in Wageningen is close to the practice in industry; they have the scientific drive, but they also have an eye for the commercial viability of an idea.'

The researchers at Croda will provide Knoop with substances to help him find the ideal toughener for PLA. He has four years in which to do this. 'We have just started with making a thorough profile of the material that is now available. Then I want to start by making relatively simple additions.'

Polylactide, like other plastics, is made up of long molecules. If these long strings lie side by side like uncooked spaghetti they form a rigid material that is very brittle. The fatty acid additives should prevent that. Knoop: 'Eventually I would also like to try and see if we can make little rubbery balls and integrate these into the PLA as shock absorbers. The balls have to be so small that they do not affect the light that shines through the plastic, but big enough to provide a rubbery elasticity.' ■