Algae occupy the lowest and most fundamental level in the ecosystems of oceans, rivers and lakes. Now, though, these simple organisms are making food way out of dry land. With the attempt to move towards a more sustainable and bio-based economy in mind, researchers and industry are more and more considering algae a high-value “crop.”

Fish farms, for example, use a huge amount of fishmeal and fish oil to feed all their fish. It takes on average two kilos of fish, which is largely made up of fish and sea animals caught in the ocean, to produce one kilo of edible farmed fish. That’s not sustainable. But there’s an alternative. Instead of serving ground fish from the open sea, we can also feed farmed fish with algae-based fish food, which is the basic food in most aquatic ecosystems. Algae—on the fast track for thousands of uni- and multi-cellular organisms that perform photosynthesis—contain many unprocessed fatty acids (like omega 3 and omega 6), antioxidants, some essential amino acids and other substances that we humans associate with a healthy diet. What’s more, algae, as a whole or as a part of the diet, can be used in food products for humans, in cosmetics, in health additivites, in animal feed and in industrial chemistry.

To show to industry that cultivating algae—called algal culture—is a viable method of moving towards a bio-based and sustainable economy in the future, Flanders’ Science Platform for Technological Research (Vito) and the University College Thomas More Kempen are building a large pilot installation, known as Sunbiol, at the Thomas More campus in Geel. The photobioreactor (PBR), a machine in which algae can grow thanks to sunlight and water without producing oxygen and biomass, is due to start working in the autumn of next year.

Growing algae how-to
So now are algae cultivated? “You have several options,” explains Bert Lemmens of Vito. “You can cultivate them in large open ponds of shallow water, with a paddle wheel that moves the water around. Those ponds are placed inside greenhouses, which opens up new opportunities for Flemish horticulture.”

Other options, he says, are cultivating them inside PBRs.

What are the challenges in introducing self-healing materials? While it’s fairly easy to develop materials that repair themselves once, it’s a lot harder to make sure they can repeat this feat. We also have to be completely sure that new products don’t cause health problems; in the past, carcinogenic substances were used. Furthermore, positive characteristics of the material are often affected after the material is adapted — the hardness, for example.

What is Flanders’ role in this research area? Since 2009, Flemish universities have been cooperating with material-producing companies in the Strategic Initiative Materials platform, funded by the government of Flanders. Researchers at Ghent University and VUB are collaborating in specialized networks, focusing on self-healing polymers, concrete and coatings. Rectical, a manufacturer of polyurethane foam products such as mattresses, supports our work. Flanders has a pioneering role worldwide, which is why the international conference on self-healing materials takes place in Ghent next year.

Q&A

Professor Herman Terry is a specialist in “self-healing materials” at the Free University of Brussels (VUB). Materials that repair themselves? It sounds like science fiction.

In fact we often make the comparison with RoboCop’s indestructible suit. But certain cars already have a coating that erases scratches and nicks when the sun shines on it. To protect its space technology, NASA develops self-healing materials. Estimates show that in five years’ time, self-healing materials will be used for aircraft, nuclear reactors and oil pipelines because tiny cracks in any of these can be a serious threat to people and the environment. It will also be far cheaper in the long term to build wind turbines with self-healing materials than to have to continually maintain and repair them.

Do all materials “heal” in the same way? Think of yourself when you are sick or injured. Often your body heals itself, but sometimes you need medicines or bandages. With, say, concrete, scientists can incorporate bacteria that automatically repair small cracks. Certain polymers need heat or light to trigger a chemical process and be “cured.” Polymers, like rubber, are easiest to make self-healing, while the most difficult material is glass. There is a lot of chemical “bil” or activity inside polymers, while glass is as good as dead chemically.

What are the challenges in introducing self-healing materials? While it’s fairly easy to develop materials that repair themselves once, it’s a lot harder to make sure they can repeat this feat. We also have to be completely sure that new products don’t cause health problems; in the past, carcinogenic substances were used. Furthermore, positive characteristics of the material are often affected after the material is adapted — the hardness, for example.

What is Flanders’ role in this research area? Since 2009, Flemish universities have been cooperating with material-producing companies in the Strategic Initiative Materials platform, funded by the government of Flanders. Researchers at Ghent University and VUB are collaborating in specialized networks, focusing on self-healing polymers, concrete and coatings. Rectical, a manufacturer of polyurethane foam products such as mattresses, supports our work. Flanders has a pioneering role worldwide, which is why the international conference on self-healing materials takes place in Ghent next year.

Interview by Andy Fantime