Pushing innovation boundaries for a sustainable future

Photo: Dr Michel Tielemans

Greek mythology tells us that Zeus, the king of the gods, took vengeance for stolen fire in heaven when Pandora's box was opened – releasing chaos into the world, but also preserving some hope. One could argue that this legend is highly prophetic for modern times and the industrial revolution, when mankind entered into a logic of mass production that was highly disruptive for the preservation of a natural equilibrium on planet earth.

"We cannot solve our problems with the same thinking we used when we created them" – Albert Einstein

Sustainable innovation is found where human creativity positively impacts our ecosystem and this will be a key driver for the decades to come. Asking ourselves about the future of coatings, I can only consider the fusion between sustainable technologies and smart coating features. Somewhat like the allegory of building the temple of technology and ultimate performance based on the strong foundation of sustainable grounds. But we need to start our journey with some humility, while working on our sustainability premises, structured in a discipline called "green chemistry" and aiming to minimise environmental impact.

We at allnex decided to exploit our sustainable core technologies with this vision of green chemistry. Our corporate *be ECOWISE*™ initiative was created to articulate our product range around five derived sustainability pillars aligned with three of the United Nations Sustainable Development Goals we adhere to: affordable and clean energy – responsible production and consumption – climate action. These five pillars are (i) Energy efficiency, (ii) Air emissions, (iii) Circular economy, (iv) Safer materials and (v) Renewable sourcing. Our most compliant products combine assets from several of these pillars and position our company as a major green player in the coatings market.

The use of renewable raw materials along the value chain is of paramount importance. The market is responding fast to ecological concerns and biopolymers are expected to grow continuously from an emerging market segment with approximately 5% share today. The consumer wishes to actively participate towards a more sustainable future that is supported by the chemical industry. Some strategic initiatives for a sustainable economy, like the European Green Deal, are setting some dynamics for change and the increasing visibility of the United Nations Sustainable Development Goals is becoming determining when considering the origin of renewable feedstocks for biodiversity and social impact. Very big brand owners in the furniture, packaging and consumer goods sectors are increasingly governing market trends by imposing sustainability rules and stringent agenda serving their transition to a circular economy. It is widely accepted that the move to plant-based materials should not compromise the coating appearance and usual performance standards of this industry.

The announced depletion of fossil resources as well as disposal and release of greenhouse gases into the atmosphere at the end of product lifetime constitute the most relevant threats. Fortunately, mother nature uses plants as reactors and sun as energy to produce about 70 billion tons of organic materials per annum by photosynthesis. Part of this biomass is already consumed for the chemical industry with bio-refineries delivering the chemicals we can use for the synthesis of biopolymers. This constitutes a unique opportunity for circularity and carbon footprint neutrality. Since there is no biobased equivalent for every existing fossil raw material we use, alternative chemical platforms derived from abundant biomass or biowaste – like natural oils, carbohydrates and terpenes – need to be revisited to create new coating generations with unique attributes. Oceans will deservedly get increasing attention. By 2050, there is a reasonable chance we will only use renewable monomers for our resin production. Consistent and cost-effective raw material availability will constitute another challenge in this conversion period, but the economy of scale will gradually push the price of renewable building blocks down while concurrently broadening the offering for truly novel molecules against traditional petrochemicals.

The sustainability value of biopolymers can be quantified by measuring their biogenic carbon content by the use of ASTM D6866 standard. Due to the bio-carbon footprint neutrality – that considers that the carbon dioxide released in the atmosphere is coming from an equivalent quantity fixed by plants during their photosynthesis – the biogenic carbon can be stoichiometrically translated into carbon dioxide emission savings. This is what we could call the "elemental carbon footprint reduction". This figure can be enlarged from cradle to grave within a complete Life Cycle Analysis of the product, used to assess the cumulative environmental impact associated with extraction, processing, usage and disposal.

I would like to illustrate my words with an example. A new generation of UCECOAT® biobased energy-curable polyurethane dispersions addresses several sustainability pillars with the use of renewable raw materials in an innovative polymer architecture containing from 20% to 75% biogenic carbon. They can be blended to achieve the desired balance of bio-carbon content and coating performance for clear and pigmented coating applications on wood. Our products avoid chemicals of concern and do not contain nor require any solvents during application and curing to hard materials. I really believe these products announce the next coating revolution, placing the environment as a centre point of innovation.

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