Bio-based energy reduction materials

Rahn is dedicated to expand further on its bio-based and sustainable UV curable products with a range of current and upcoming products.

Today, sustainability seems to be on the top of many headlines, and the issues are only gaining in importance. This topic is multifaceted, however one area of critical focus is on the use of bio-based materials in the production of 'finished products', such as inks and coatings.

Ultraviolet or electron beam (UV/EB) curing of inks and coatings is already considered environmentally friendly due to being more energy-efficient and with lower emissions than conventional technologies. Recently, that energy efficiency has been further improved with the development of UV-LED lamps. A next logical step to advance the sustainability of UV/EB is to expand on and develop new bio-based oligomers and monomers.

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According to the European Commission, bio-based products, also known as bio-renewable or re-growable products, are wholly or partly derived from materials of biological origin, excluding materials embedded in geological formations and/or fossilised. In using bio-based products, it is possible to reduce cumulative carbon footprints, remove reliance on fossil fuels as feedstock materials, and offer other advantages such as lower toxicity or novel product characteristics. It is also desirable that these materials are not based on biomass originating from food sources or replacing areas already growing food; to be fully sustainable, they should ideally be derived from waste materials.

In the UV/EB industry, bio-based curable products have been around for many years, but usually centring on epoxidised soya bean oil (ESBO), fatty acids or glycerol. Acrylates of ESBO usually have the highest bio-content, but these oligomers tend to be slow to cure and too soft to satisfy all requirements of the ink and coatings industry. Fatty acids or glycerols are usually only used to modify oligomers and, hence, yield low bio-based content.

More recently, the industry is beginning to see commercialisation of other bio-based materials, and even bio-based acrylic acid could eventually become available. These new molecules expand the toolbox for acrylate product manufacturers, creating new materials with better properties, capable of competing with standard oil-based chemistries. Unfortunately, many of these new products are still in development, and regulatory restrictions make full commercialisation difficult. Rising costs for global registration already restrict the release of new bio-based monomers and oligomers from entering the market, and it is, therefore, challenging to produce commercial products at a price that is acceptable to industry. Green chemistry is wanted but it must be at a commercially acceptable price to be fully sustainable.

Furthermore, while bio-based products will reduce dependency on fossil fuels, their bio-based content is not an indicator of the biodegradability of a material. As with some fossil fuel-based products, some bio-based products can be made biodegradable, but certainly not all bioplastics are biodegradable. Therefore, bio-based materials are not the answer to the 'plastic reduction revolution' that is under way, but they are part of a larger sustainable solution package.

Rahn actively looks at ways to improve sustainability in the energy curing industry, releasing two new oligomers in its bio-renewable product range, GENOMER* 3143 and GENOMER* 4293. GENOMER* 3143, a mono-functional polyester acrylate, which can be used in a range of formulations, including adhesives, UV hot melts, 3D printing and in-mould applications. GENOMER* 4293 is a difunctional urethane acrylate that cures without yellowing, gives high hardness and excellent scratch resistance. Applications include inks, coatings and 3D printing.

Products to come

The new urethane acrylate is extremely hard, and significantly harder than other products in our portfolio. Comparison with epoxy methacrylate 97-053, a typical material used to improve hardness, effectively illustrates this.

GENOMER* 3143 and GENOMER* 4293 also show interesting thermal properties, which can give rise to memory effect objects or heat-sealing adhesives. The bio-renewable content is approximately 81% and 56% respectively.

These two new oligomers compliment other bio-based oligomers available from Rahn, all of which can be seen in its 'Bio-based content of Rahn products' product flash. The recently increased demand for bio-renewable products is here to stay, which is a major positive – even the recent pandemic has not reduced this momentum. In this case, consumers are the main driver, and brand owners are responding positively, especially in the food packaging, wood coating and furniture industries. Rahn is dedicated to expand further on its bio-based and sustainable products, and more are to follow. ●

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