

## Press conference on research and development at Evonik, December 4, 2013

### **Let's make it work! Plastics from renewable raw materials**

#### **Dr. Jürgen Herwig, Vice President Process and Product Development for High Performance Polymers**

Evonik is an important provider of high-performance polymers for a wide variety of applications. These polymers must perform special jobs and, in some cases, do so for very long periods of time.

Examples of applications include the soles of athletic shoes made from polyamide 12 that have to withstand bending stress for extended periods, brake pressure lines that have to be flexible yet stable when exposed to environmental influences ranging all the way up to impact stress, and dishwasher racks that spend years in an aggressive environment of changing temperature and moisture levels.

Today, most plastics are manufactured on the basis of petroleum. Evonik's goal, however, is to move toward more flexible and sustainable sources of raw materials. Environmental awareness is likewise growing among the company's clientele. The challenge here is to develop bio-based products that continue to meet our exceptionally high standards of quality yet remain competitive.

Evonik is a leading manufacturer of high-performance polymer polyamide 12 (PA12). In a project funded by Germany's Federal Ministry of Education and Research, Evonik has managed to develop a process for manufacturing PA12 utilizing palm kernel oil as a renewable raw material and significantly reducing the number of production steps. The conventional, multi-stage production process leads to the monomer lauryl lactam (LL); the new method, however, is based on palm kernel oil and generates an alternative PA12 precursor:  $\omega$ -amino lauric acid (ALA), which can be polymerized to an identical PA12. The key conversion step is catalyzed by *E. coli* bacteria in a fermenter.

Developing the strain, the method, and the processing steps all began over five years ago. Because the bacteria cannot withstand relatively large concentrations of the product 12 aminolauric acid methyl ester (ALAME) they generate—as is also the case with alcoholic fermentation—Evonik had to develop an entirely new technology: two-phase fermentation. In this method, the product generated within the reactor is removed from the fermentation liquor; it is transferred, in other words, to another liquid phase. Developing this method meant bundling the extremely wide range of expertise that can only be found in correspondingly large companies. The new technology is protected by roughly 20 patent families.

Evonik started up a pilot plant for making  $\omega$ -amino lauric acid in early 2013. The plant is located at Evonik's fermentation site in Slovenská Ľupča (Slovakia), which is home to highly specialized employees and an infrastructure geared specifically to fermentation.

The new method offers a long-term option for supplementing petroleum-based production of PA12.

The development of the fermentation process for the polyamide precursor stage  $\omega$ -amino lauric acid (ALA) was subsidized by the Federal Ministry of Education and Research.