
# 2nd PHA platform World Congress 2020 …from Embryonic to Early Growth

## Abstracts Webinar 2 September 2020

1. **10:30 - 11:00: Jan Ravenstijn**

PHB and its co-polymers, all part of the PHA-polymer platform, have been developed as the first polymer family made by fermentation, i.e. by mimicking nature. The first attempt to start with the industrial production of a PHA-polymer was in 1992, but market interest was low due to the very high price at that time, while interest for environmental issues were minimal.

Strong alignments in the value chain and significant developments in fermentation, downstream processing, product design, additives and application technologies have not only resulted in the construction and start-up of several PHA-polymer manufacturing plants in late 2019, but also in very high capacity utilization rates, since demand exceeds supply by far today. As a result a number of companies plan to build new, large scale capacity for start-up during the next few years.

Examples will be given to illustrate the activities mentioned, to discuss what is done and needs to be done to accelerate the industrialization of this PHA-platform and to summarize the capacity expansion plans for the next 5 years.

**11:00 - 11:30: Kuk-Ki Hong**

PHA has had a long history because of its broadness of properties and biodegradability. PHA is considered one of the key solutions for environmental issues. Among diverse types of PHA, amorphous PHA based on 3HB and 4HB as a copolymer has the unique property like rubber and transparent feature. Metabolix, a startup in Boston, USA, developed this aPHA over one decade ago. Even though the aPHA has vast potential; however, mass production of it was left for being an available product in a market.

CJ BIO is a bio-products producer, such as amino acids and nucleotides for feed additives, food flavors using fermentation technology since 1970. It has been developed over 700 thousand tons of bio-products.

We believe the combination of aPHA and mass fermentation techniques can create contribution points for bioplastic industry.

CJ BIO will produce a few thousand tons initially and expand production volume like the case of amino acids.

With GO!PHA, we hope to find a way for growth of PHA market.


**11:30 - 12:00: Rick Passenier**

For years the PHA-platform industry has struggled to capitalize on the promise to deliver an economic and technically viable alternative to fossil-based plastics. Protectionism, industrial rivalry and a lack of a coordinated positioning of PHA next to other materials have not contributed to its development.

In 2018, during the 1st PHA-platform World Congress, the foundations of the Global Organization for PHA – **GO!**PHA, were formed, recognizing a strong need for value chain and pre-competitive collaboration, to accelerate the development of the PHA-platform industry and PHA adoption in the market. By now **GO!**PHA consists of more than 40 actively contributing businesses and academia, striving for the same goal.

**GO!**PHA continuously deploys joint activities in technology and application development, advocacy and communication, and other matters that benefit the PHA-platform as a whole. In this talk, we will outline some of the major developments and challenges that we have dealt with in the last two years, and highlight some of the opportunities we foresee to develop the industry further.

**12:00 - 12:30: Lara Dammer**

With considerable speed, the Circular Economy Package and corresponding plastics legislation were adopted by EU institutions. One of the most prominent legislative initiatives in recent years has been the adoption of the Single-Use Plastics Directive. With this, the Commission intends to curb plastic littering by replacing single-use plastic products with multi-use items or changing consumption behaviour completely. Other initiatives in focus will be the Plastics Strategy, the New Circular Economy Action Plan and other actions foreseen in the European Green Deal.

The proposed presentation will give an overview of the current regulation, its scope, exceptions and potential implications for bioplastic markets. Special attention will be given to the issue of “natural polymers” that is currently hotly debated also by the PHA industry. What do the official documents say and how are they interpreted by policy makers? Decisions are expected for August/September of 2020, so the presentation will be able to provide the latest information for the PHA World Congress webinar.


**12:30 - 13:00: Anindya Mukherjee**

The awareness that plastics, though ubiquitous in our lives, is a leading cause of pollution has finally taken hold among consumers and various stakeholders including policy makers. But it is colored with different shades of grey due to our proximity to the problem. We all have experienced plastics litter and now there is consensus that they are affecting our well-being in the form of food contamination, release of toxins, and dying birds and animals. On top, the issue of microplastics and the extent to which it can adversely affect us is just now emerging.

Naturally policy makers around the world have taken action in preventing plastics pollution by banning plastics, mostly in single use applications. However, this is the tip of the iceberg. We are seeing only about 10% of the problem. We don't see the other 90%. This comes in the form of plastics being dumped in landfills and incinerated for energy releasing greenhouse gases and toxins. A recent study concluded that until 2015, we have produced 8.3 Bil. tons of plastics since the early 1950's, of which 9% have been recycled, 11% incinerated and the rest, or 6.3 Bil. tons, are still with us in our environment and in landfills. This number is expected to go to 12.3 Bil. tons by 2050 without major mitigation.

PHA has a unique role to play in reducing this heavy burden of our planet. The natural and circular nature of PHA can significantly reduce plastics accumulation and pollution. In this presentation, I will attempt to give you a flavor for the ongoing legislative efforts to ban plastics, and provide you with an approach to make that constructive while keeping the benefits of plastics that we all have come to enjoy.

2. **13:00 - 13:30: Ronald Krijns**

Virtually all coatings contain small amounts of additives. These have several functions, e.g. enhanced levelling, alteration of visual appearance, improvement of mechanical properties and durability, to name a few.

Current additives are predominantly based on traditional synthetic polymers and most will sooner or later be regarded as micro-plastic. We describe the use of virgin PHA, CERAFLOUR 1000®, as an innovative alternative.

Special emphasis will be on viscosity, matting and haptics. Furthermore, a short overview of the critical PHA properties for this non-plastic application and foreseeable volumes will be given.


3. **13:30 - 14:00: Lenka Minarova**

The EU has prepared a new vision for Europe - European Green Deal (EGD). The individual strategies of EGD are gradually being published. Each of them brings new opportunities for natural polymer PHA.

NAFIGATE Corporation built the strategy for Hydal PHA on EGD. The aim of the presentation is to present the whole strategic concept of Hydal PHA.

4. **14:00 - 14:30: Ramani Narayan**

PHAs like PHB Poly(3-hydroxybutyrate), PHBV poly(3-hydroxybutyrate-co-3-hydroxyvalerate), and PHBH poly(3-hydroxybutyrate-co-3-hydroxyhexanoate) are demonstrated to be completely biodegradable in short, measurable time periods using ASTM/ISO standard test methods. The laboratory test methods measure biodegradability in the 20-30°C temperature range. Certification schemes like "OK Marine" are provided based on these laboratory test at 30°C. There may be coastal waters around this temperature, but 4 °C is a generally accepted temperature regime for the oceans especially at depths (these biodegradable plastics have density greater than 1 and will not float like PEs and PPs). Temperature will play a critical role in the rate and extent of biodegradability in the ocean environment.
In this presentation, we report on the effect of temperature on the biodegradability of cellulose and PHBV in an aqueous environment seeded with a biologically aggressive microbial inoculum obtained from activated sludge from a local waste water treatment plant. The testing was done at three different temperatures using ISO 14852 (Determination of the ultimate aerobic biodegradability of plastic materials in an aqueous medium — Method by analysis of evolved carbon dioxide). The percent biodegradability vs time rate data followed first order kinetic model. Using this data, biodegradation rate (k; day-1) at each temperature was determined and fitted to the empirical Arrhenius equation to give the energy of activation Ea. We analyzed data from PHA biodegradation papers in the literature and calculated biodegradation rates and activation energies. Using our experimental data, we calculate the time required for all of the PHBV carbons to be mineralized and completely removed from the ocean environment.

Based on the learnings from this work, we will discuss and address the following questions:
1. Are generic claims of "marine biodegradable" based on testing at 30 C responsible and acceptable?
2. How long do these fully biodegradable polymers stay in the environment and in what form and their impact, if any on the ocean habitat?
3. What guidance can we develop for biodegradable labelling and communication as it relates to ocean environments?


5. **14:30 - 15:00: Phil Van Trump**

PHA's hold great promise to produce articles that degrade in a wide range of environments including home compost. Many articles in use today are soiled with food and even if produced with a readily recyclable polymer are diverted to landfills and incinerators due to low mass per article coupled with being soiled prevents being reutilized.

Use of PHA's present an opportunity to use "nature" to recycle these articles. An opportunity for a new value chain will be presented with application highlights.

6. **15:00 - 15:30: Rolf Luther**

Presently mainly used thickening agents for lubricating greases are metal soaps, inorganic filling materials or polyurea types. Partly these components have to be seen critically from an environmental point of view, but the technical applications (machines, bearings etc.) indispensably require to date specific minimum properties of the respective lubricant.

Different, oil-soluble polymers are known for use in liquid lubricants as viscosity modifiers but are rarely used in grease formulations. Due to progressive constraints of conventional raw materials new approaches for thickening agents for greases and binding agents for lubricant varnish are of high interest.

In the German funded project PHAt the partners Fraunhofer UMSICHT, Fritzmeier Umwelttechnik, UnaveraChemLab and FUCHS Schmierstoffe aim for the development and validation of new biobased polymeric thickeners on base of biobased polyhydroxyalcanoates (PHA) for application in lubricants. The properties of the PHA have to be adapted to the requirement profile of the respective application. By chemical modifications e.g. modulation of chain lengths and implementation of branched structures, the required material properties can be adjusted. For an application in lubricants the PHA types have to be compatible with conventional raw materials to enable technical processing and have to possess satisfying thickening effects to achieve needed consistency. Due to the biobased character and the potential biodegradability the new polymer class of PHA has the potential to partially replace conventional thickening and binding agents in greases and lubricating varnishes, providing a contribution to environment protection.


7. **15:30 - 16:00: Blake Lindsey**

PHA is the most viable material solution for many of the problems created by plastics. Unfortunately, plastic is ubiquitous, and the petroleum industry has done an outstanding job of creating a perception that they care and are doing something to combat the growing list of problems. The truth is, they really aren't making an environmental difference.
Therein lies the opportunity for PHA, and for each of us who want to make a difference in the world.
This presentation will encourage you to engage and share, to voice concerns and opinions. We will discuss where we are in the lifecycle of PHA, the importance of innovation, the role of collaboration and the demands of the market. We'll also discuss the importance of appealing to consumers with a narrative that can be embraced. My goal will be to assist and encourage you to share the story of PHA.

8. **15:30 - 16:00: Alessandro Carfagnini**

SABIOMATERIALS has developed new materials branded as BIODURA that are based on commercial PHA-polymers for several different durable applications. The materials can easily be processed through traditional processing technologies like injection moulding for instance. Among others, nucleation challenges after processing have been solved. Cycle times are sometimes even shorter than for traditional fossil-based alternative materials. It has been demonstrated that the material BIODURA is suitable to replace traditional thermoplastics in many durable applications. Technologies required to be successful in both product and application developments have been taken care of.

However, there are also a few challenges to be addressed. The main one is a lack of available PHA-polymers for the market, which makes it very difficult to penetrate that market. The second challenge is the high price for PHA-polymers that has to be paid currently even it is available in small quantities only. For successful market penetration of our new PHA-based materials we are looking at the PHA-polymer producers in the world to address these issues successfully.

Subject to changes