

Petro vs. Bio-based Plastics

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Currently, approximately 200 million tonnes of plastics are produced annually, viz. 30 kg/capita in the world. In view of the unbalanced distribution regarding the consumption of plastics, appr. 150 kg/capita in the Western world and Japan, and less than an average of 10 kg/capita in Asia, expectations are running high regarding the future growth of plastics. Some EU studies predict the plastic consumption to grow even by a factor of 10 in the year 2100, viz. 2000 million tonnes/annum!

Plastics are based on oil and currently appr. 5% of the world oil production is used to make plastics. If the consumption of plastics increases in this Century as forecasted by several studies then we might need up to 50% of the current oil production to produce plastics. In view of oil depletion towards the end of this Century, this growth can not be realized based on oil.

Bio-based plastics are promoted as an alternative to replace petro-based plastics and many marketing studies predict that bioplastics will grow with at least 20% per annum. The European Bioplastics society (www.european-bioplastics.org), however, predict a much faster growth, close to 900.000 tonnes/annum by 2010, of which 800.000 tonnes based on bioplastics based on renewable sources (Thermoplastic Starch/TPS, PLA and PHB).

At this point in time, however, one has to conclude that the expectations regarding the growth of bio-based plastics as alternatives for petro-based plastics is below any forecast. The main problem with bio-based polymers is their poor processability, notably of biopolymers which have grown intra-cellular and possess a very high molar mass (to reduce the osmotic pressure) such as PHB and starch, and/or they lack the physical/mechanical properties of synthetic counterparts, viz. PLA vs. PET.

Bio-based plastics might have a growth potential if proper legislation is implemented and but alternative sources to make plastics are also coming up soon, e.g. ethylene derived from bio-ethanol (Braskem) and feedstock (monomers) from gas (Sasol, BP, Shell).

In this lecture, some fact and figures will be presented aiming to forecast the (near) future.

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