Glossary

In bioplastics MAGAZINE again and again the same expressions appear that some of our readers might (not yet) be familiar with. This glossary shall help with these terms and shall help avoid repeated explanations such as 'PLA (Polylactide)' in various articles.

Bioplastics (as defined by European Bioplastics e.V.) is a term used to define two different kinds of plastics:

a. Plastics based on renewable resources (the focus is the origin of the raw material used)

b. → Biodegradable and compostable plastics according to EN13432 or similar standards (the focus is the compostability of the final product; biodegradable and compostable plastics can be based on renewable (biobased) and/or non-renewable (fossil) resources).

Bioplastics may be
- based on renewable resources and biodegradable;
- based on renewable resources but not be biodegradable; and
- based on fossil resources and biodegradable.

Amylopectin | Polymeric branched starch molecule with very high molecular weight (biopolymer, monomer is → Glucose).

Amyloseacetat | Linear polymeric glucose-chains are called → amylose. If this compound is treated with ethan acid one product is amylacetat. The hydroxyl group is connected with the organic acid fragment.

Amylose | Polymeric non-branched starch molecule with high molecular weight (biopolymer, monomer is → Glucose).

Biodegradable Plastics | Biodegradable Plastics are plastics that are completely assimilated by the → microorganisms present a defined environment as food for their energy. The carbon of the plastic must completely be converted into CO_2 during the microbial process. For an official definition, please refer to the standards e.g. ISO or in Europe: EN 14995 Plastics- Evaluation of compostability - Test scheme and specifications. [bM 02/2006 p. 34f, bM 01/2007 p38].

Blend | Mixture of plastics, polymer alloy of at least two microscopically dispersed and molecularly distributed base polymers.

Carbon neutral | Carbon neutral describes a process that has a negligible impact on total atmospheric CO_2 levels. For example, carbon neutrality means that any CO_2 released when a plant decomposes or is burnt is offset by an equal amount of CO_2 absorbed by the plant through photosynthesis when it is growing.

Cellophane | Clear film on the basis of → cellulose.

Cellulose | Polymeric molecule with very high molecular weight (biopolymer, monomer is → Glucose), industrial production from wood or cotton, to manufacture paper, plastics and fibres.

Compost | A soil conditioning material of decomposing organic matter which provides nutrients and enhances soil structure.

Compostable Plastics | Plastics that are biodegradable under 'composting' conditions: specified humidity, temperature, → microorganisms and timefame. Several national and international standards exist for clearer definitions, for example EN 14995 Plastics - Evaluation of compostability - Test scheme and specifications [bM 02/2006 p. 34f, bM 01/2007 p38].

Composting | A solid waste management technique that uses natural process to convert organic materials to CO_2, water and humus through the action of → microorganisms [bM 03/2007].

Copolymer | Plastic composed of different monomers.

Fermentation | Biochemical reactions controlled by → microorganisms or enyzmes (e.g. the transformation of sugar into lactic acid).

Gelatine | Translucent brittle solid substance, colorless or slightly yellow, nearly tasteless and odorless, extracted from the collagen inside animals' connective tissue.

Glucose | Monosaccharide (or simple sugar). G. is the most important carbohydrate (sugar) in biology. G. is formed by photosynthesis or hydrolyse of many carbohydrates e. g. starch.

Humus | In agriculture, 'humus' is often used simply to mean mature → compost, or natural compost extracted from a forest or other spontaneous source for use to amend soil.

Hydrophilic | Property: 'water-friendly', soluble in water or other polar solvents (e.g. used in conjunction with a plastic which is not waterresistant and weatherproof or that absorbs water such as Polyamide (PA).

Hydrophobic | Property: 'water-resistant', not soluble in water (e.g. a plastic which is water-resistant and weatherproof, or that does not absorb any water such as Polethylene (PE) or Polypropylene (PP).

Microorganism | Living organisms of microscopic size, such as bacteria, funghi or yeast.

PCL | Polycaprolactone, a synthetic (fossil based), biodegradable bioplastic, e.g. used as a blend component.

PHA | Polyhydroxyalkanoates are linear polyesters produced in nature by bacterial fermentation of sugar or lipids. The most common type of PHA is → PHB.

Readers who know better explanations or who would like to suggest other explanations to be added to the list, please contact the editor.
[*: bM ... refers to more comprehensive article previously published in bioplastics MAGAZINE]

PHB | Polyhydroxyl buteric acid (better poly-3-hydroxybutyrate), is a polyhydroxyalkanoate (PHA), a polymer belonging to the polyesters class. PHB is produced by micro-organisms apparently in response to conditions of physiological stress. The polymer is primarily a product of carbon assimilation (from glucose or starch) and is employed by micro-organisms as a form of energy storage molecule to be metabolized when other common energy sources are not available. PHB has properties similar to those of PP, however it is stiffer and more brittle.

PLA | Polylactide or Polylactic Acid (PLA) is a biodegradable, thermoplastic, aliphatic polyester from lactic acid. Lactic acid is made from dextrose by fermentation. Bacterial fermentation is used to produce lactic acid from corn starch, cane sugar or other sources. However, lactic acid cannot be directly polymerized to a useful product, because each polymerization reaction generates one molecule of water, the presence of which degrades the forming polymer chain to the point that only very low molecular weights are observed. Instead, lactic acid is oligomerized and then catalytically dimerized to make the cyclic lactide monomer. Although dimerization also generates water, it can be separated prior to polymerization. PLA of high molecular weight is produced from the lactide monomer by ring-opening polymerization using a catalyst. This mechanism does not generate additional water, and hence, a wide range of molecular weights are accessible (bM 01/2009).

Saccharins or carbohydrates | Saccharins or carbohydrates are name for the sugar-family. Saccharins are monomer or polymer sugar units. For example, there are known mono-, di- and polysaccharose. → glucose is a monosaccarin. They are important for the diet and produced biology in plants.

Sorbitol | Sugar alcohol, obtained by reduction of glucose changing the aldehyde group to an additional hydroxyl group. S. is used as a plasticiser for bioplastics based on starch.

Starch | Natural polymer (carbohydrate) consisting of → amylose and → amylopectin, gained from maize, potatoes, wheat, tapioca etc. When glucose is connected to polymer-chains in definite way the result (product) is called starch. Each molecule is based on 300 -12000-glucose units. Depending on the connection, there are two types → amylose and → amylopectin known.

Starch (-derivate) | Starch (-derivates) are based on the chemical structure of → starch. The chemical structure can be changed by introducing new functional groups without changing the → starch polymer. The product has different chemical qualities. Mostly the hydrophilic character is not the same.

Starch-ester | One characteristic of every starch-chain is a free hydroxyl group. When every hydroxyl group is connect with ethan acid one product is starch-ester with different chemical properties.

Starch propionate and starch butyrate | Starch propionate and starch butyrate can be synthesised by treating the → starch with propane or butanic acid. The product structure is still based on → starch. Every based → glucose fragment is connected with a propionate or butyrate ester group. The product is more hydrophobic than → starch.

Sustainable | An attempt to provide the best outcomes for the human and natural environments both now and into the indefinite future. One of the most often cited definitions of sustainability is the one created by the Brundtland Commission, led by the former Norwegian Prime Minister Gro Harlem Brundtland. The Brundtland Commission defined sustainable development as development that 'meets the needs of the present without compromising the ability of future generations to meet their own needs.' Sustainability relates to the continuity of economic, social, institutional and environmental aspects of human society, as well as the non-human environment).

Sustainability | (as defined by European Bioplastics e.V.) has three dimensions: economic, social and environmental. This has been known as "the triple bottom line of sustainability". This means that sustainable development involves the simultaneous pursuit of economic prosperity, environmental protection and social equity. In other words, businesses have to expand their responsibility to include these environmental and social dimensions. Sustainability is about making products useful to markets and, at the same time, having societal benefits and lower environmental impact than the alternatives currently available. It also implies a commitment to continuous improvement that should result in a further reduction of the environmental footprint of today's products, processes and raw materials used.

Thermoplastics | Plastics which soften or melt when heated and solidify when cooled (solid at room temperature).

Yard Waste | Grass clippings, leaves, trimmings, garden residue.