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Cross-Industry technical paper on cellulose with respect to the upcoming guidelines of Directive (EU) 2019/904ⁱ.

We would like to share our views about the definition of ‘plastic’ under Directive 2019/904 on Single Use Plastics (SUPD) especially in relation to how non-chemically modified natural polymers should be interpreted.

The ECHA Guidance for monomers and polymers for the implementation of REACH April 2012, version 2.0 and Article 3(39) of REACH explain that natural polymers are the result of a polymerization process that has taken place in nature, independently of the extraction process. A non-chemically modified substance is defined under Article 3(40) of REACH as a substance whose chemical structure remains unchanged, even if it has undergone a chemical process or treatment, or a physical mineralogical transformation, for instance to remove impurities.

Based on our understanding of the definitions, the commercial cellulose fibre grades such as Kraft pulp, Sulphite pulp, and CTMP as well as the cellulose grades such as dissolving pulp and Cellulose powder, are not in the scope of the SUP Directive as they are made of the natural polymer cellulose, because:

1. In nature, cellulose of different chain lengths, linearity/branching and crystallinity is produced between different organisms (for example plant cellulose versus microbial cellulose) and even within one organism (crystalline versus amorphous cellulose in wood fibres). The natural materials are organized in a complex form. In pulp and paper, the cellulose is isolated and the chemical nature is the same as in the wood. The components in the wood are linked and organized in a supra structure, the cell wall. Therefore the polymerisation takes place in nature and not in an industrial setting.
2. The pulping is a disaggregation process, usually called “deconstruction” which means wood is separated into wood fibres containing cellulose, hemicelluloses and lignin. For the isolation of a natural polymer from a natural source, a process should be applied, usually hydrolysis (alkaline, acid or enzymatic), and this does not affect the nature of the polymer. It could decrease the molecular weight or promote additional linkages, but the polymer is the same. The cellulose nature in pulp and paper is the same linear chain of several hundred to many thousands of β linked D-glucose units.
3. Cellulose intrinsic crystallinity within wood fibres is the main contributor to the preservation of the chemical structure, even after the chemical extraction process. The incidental hydrolysis does not cause any change in the chemical properties of the constituents of the pulp. Merely a depolymerisation of the constituted polymers occurs.

Based on this information, we would also recommend that ECHA only considers the endpoint of the manufacturing process when considering whether the chemical structure of a natural polymer has been modified or not.

ⁱ Directive (EU) 2019/904 of the European Parliament and of the Council of 5 June 2019 on the reduction of the impact of certain plastic products on the environment