

References for the Lack of Toxicity of Polyolefines Containing AddiFlex

- A.** All polyolefines degrade as a result of oxidation in a manner similar to natural products like rubber and lignin. Depending on the type of polyolefine, the amount and types of additives to either accelerate or retard the degradation and the environment, this degradation can be slow, i.e. taking many years, or fast, taking (in extreme circumstances) only a few hours.

Firstly, it is very important to note that polyethylene and polypropylene are not listed by the Environmental Protection Agency (EPA) in the USA as a hazardous or toxic substance, nor are they listed in any similar lists in Europe, except in the form of “non-degradable” pellets, where there can be a hazard due to ingestion by animals.

The primary mechanism of the breakdown of polyolefines is initially oxidation or photo-oxidation, which occurs in a manner similar to oxidative rancidity of foods. All the studies of the intermediates and final products of this oxidation have shown that the compounds formed are similar although the proportions may vary according to the exact mechanism^{1,2}.

The mineralization of these compounds, i.e. conversion by microorganisms to carbon dioxide, water and biomass has been shown by several studies^{3,4,5}. This confirms the lack of toxicity.

- B.** The biodegradation Additive AddiFlex HE and HES fulfils the demand of the: European Parliament and Council Directive 94/62/EC of 20 December 1994 on packaging and packaging waste According Article 11 Concentration levels of heavy metals present in packaging:
1. Member States shall ensure that the sum of concentration levels of lead, cadmium, mercury and hexavalent chromium present in packaging or packaging components shall not exceed the following: 100 ppm by weight five years after the date referred to in Article 22. AddiFlex does not exceed those levels.
- C.** AddiFlex does not add sulphur or cobalt nor any salt related to those mentioned metals to the let down polymers.

References

1. Albertsson, A.-C., Barenstedt, C., and Karlsson, S., *Acta Polymer*, **45**, 97, (1994)
2. Kostyniak, P. J., Syracuse, J., McReynolds, J., Wang, X., Greizerstein, H. B., Toxicology Research Center and Department of Pharmacology, University at Buffalo, NY, USA. Report.
3. Albertsson, A.-C., Barenstedt, C., Karlsson, S., *Journal of Environmental Polymer Degradation*, Vol. 1, No.4, 1993.
4. Chiellini, E., Corti, A., Swift, G., *Polymer Degradation and Stability*, **81**, 341, (2003).
5. Jakubowicz, I., *Polymer Degradation and Stability*, **80**, 39, (2003).