

Environmental biodegradation performance of PHA polymers in the open environment & options for LCA

Current life cycle analysis methodologies lack indicators to assess the biodegradation of plastic materials introduced to the natural environment. If ending up in the sea, our lakes and rivers, or in soil some polymers are assumed to be less persistent than conventional ones. “How long it takes” until biodegraded “depends where it ends”. We present data of different PHAs exposed under relevant environmental marine, freshwater and soil conditions to illustrate the variation in half-lives of polymers when ended up in the environment. We apply a multi-tier test scheme of reliable and environmentally relevant methods in laboratory, mesocosm, field and ecotox testing to assess the environmental biodegradation as well as the disintegration performance. The mathematical modeling of the experimental results and the calculation of a specific half-life of a plastic material under specific environmental conditions show that the persistence is highly depending on where a certain polymer item is ending up. The half-life and specific surface degradation rates of a polymer thus allows for the numerical comparison of different environmental scenarios and can be fed into LCA models.