

Cosmetic Bioglitter™ - Independent Fresh water Biodegradability Testing Results

Background

The specialised modified regenerated core films, the main raw materials used in used in Cosmetic Bioglitter™ Sparkle and Cosmetic Bioglitter™ Pure and unique to Bioglitter™, are certified to the following:

Industrial Environments

- Industrial compostability: EN13432, EN14995, ASTM D6400 and ISO 17088
- Anaerobic digestion: ISO 15985

Natural Environments

- Home compostability: OK Compost Home
- Marine biodegradation: ASTM D6691-09

Alternative film technologies from which glitter can be made such as PLA (Polylactic acid / Polylactide) or Cellulose Acetate are only compostable under composting conditions such as Industrial Composting to EN14432 and do not readily biodegrade in the natural environment. Forms of Cellulose such as traditional regenerated cellulose film (Cellophane™) does not even readily industrial compost, so there is very little hope for it to biodegrade in the natural environment.

The specialised naturally biodegradable core films (base films) used in our Cosmetic Bioglitter™ products are coated with either a clear or coloured coating prior to precision cutting to glitter. Cosmetic Bioglitter™ Sparkle coating currently contains a small amount of synthetic polymer and Cosmetic Bioglitter™ Pure coating is novel and naturally derived.

Glitter does not only consist of the film core, but, contain other ingredients such as those in the clear and coloured coating applied to the film core during glitter manufacture. These ingredients and coatings can have a detrimental effect on the final biodegradability performance of the finished glitter. Therefore, despite the excellent biodegradability credentials of the core film used in Bioglitter™, we thought we should also independently test the credentials of our finished Bioglitter™ product, to prove categorically that it biodegrades in the natural environment. Following close consultation with our accredited testing partner OWS, it was decided freshwater biodegradability testing to ISO 14851 was most appropriate.

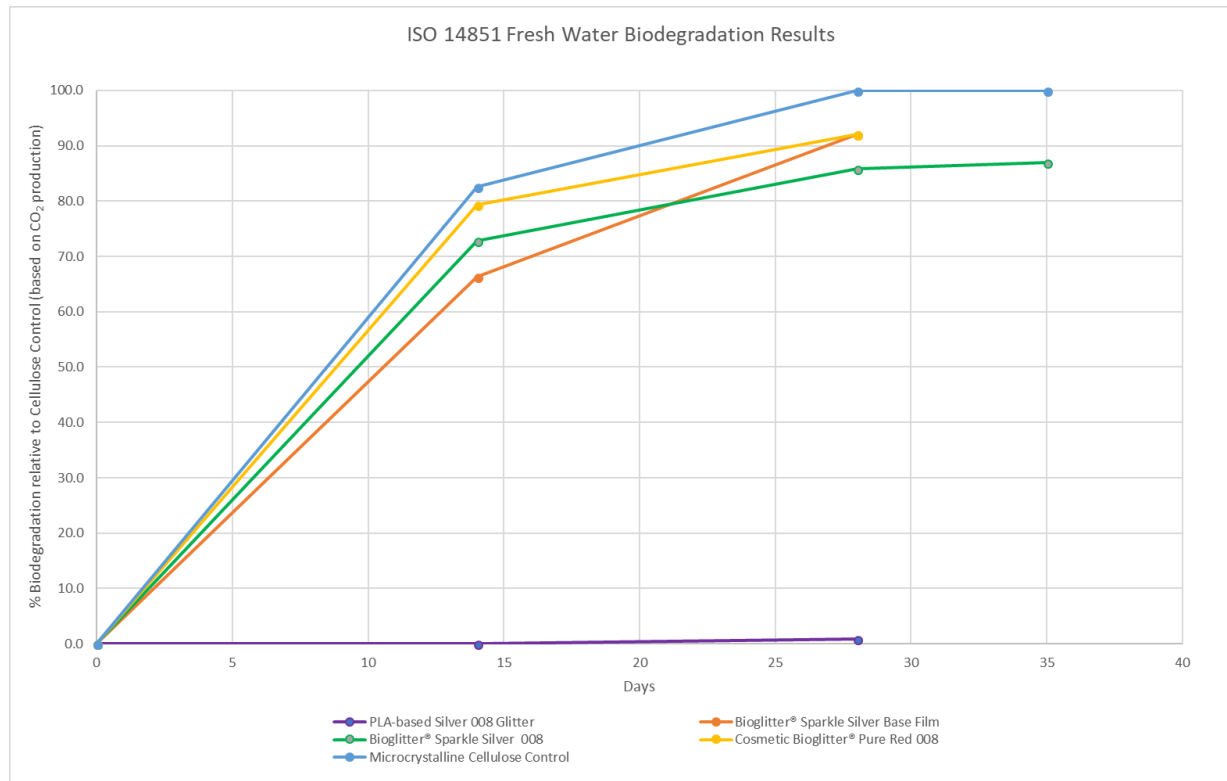
The decision on test method was based on the nature of our material (insoluble solid as opposed to a chemical), the most probable end of life scenarios for Bioglitter™ also the ability to apply for TÜV, *OK biodegradable WATER* certification using test data generated using this method.

ISO 14851 Test Results – Fresh water Biodegradation

This aqueous biodegradation test determines the degree of aerobic biodegradability of the test samples by exposure in an aqueous medium (under laboratory conditions) to an inoculum of micro-organisms representative of the natural environment.

The conditions used in this International Standard do not necessarily correspond to the optimum conditions allowing maximum biodegradation to occur, but the standard is designed to determine the potential biodegradability of materials or give an indication of their biodegradability in natural environments.

During the aerobic biodegradation of the organic materials in the aqueous medium, oxygen is consumed and carbon is converted to gaseous, mineral carbon in the form of carbon dioxide (CO₂). The biodegradation based on CO₂ production is calculated as the percentage of solid carbon in the test compound which has been converted to gaseous, mineral carbon in the form of CO₂.



Interpretation of Results

- The PLA-based glitter (PLA Silver 008 glitter - purple line on the chart) shows c.0% biodegradation. This is as expected, as PLA is well known to have very poor biodegradability in the natural environment.
- Cosmetic Bioglitter™ Sparkle
 - Cosmetic Bioglitter™ Sparkle (represented by Bioglitter Silver 008 – green line on the chart) biodegrades readily, as per the core film used in Bioglitter™ when tested on its own (orange line on the chart), but does not quite achieve the same level, this as expected due to the synthetic coating on its surface,
 - Well within the 56 day test period, Bioglitter™ Sparkle has biodegraded to a level of 87% (relative to the microcrystalline cellulose control), which proves that Cosmetic Bioglitter Sparkle biodegrades very well in natural, fresh water environments or in other words, biodegradation in these conditions is very well progressed.

- A level of >90% biodegradation within 56 days relative to the microcrystalline cellulose control is required to meet the biodegradation criteria for *OK biodegradable WATER* certification from TÜV, Austria. Therefore, Cosmetic Bioglitter™ Sparkle only has 3% further to go to meet the criteria. Our aim of removing the last of the remaining synthetic polymer content (and therefore increasing biodegradable content) in Bioglitter™ Sparkle will ultimately allow us to achieve certification.
- Ecotoxicity and heavy metals test results for Bioglitter™ Sparkle indicate we will meet the Environmental safety and Chemical characteristics requirements for *OK biodegradable WATER* certification
- **Cosmetic Bioglitter™ SPARKLE has also been independently tested to OECD 301F for freshwater biodegradability and qualifies as Readily Biodegradable, achieving >90% biodegradation in 26 days.** To qualify for Readily Biodegradable a product must show >60% biodegradation in 28 days.
- Cosmetic Bioglitter™ Pure
 - Cosmetic Bioglitter™ Pure (represented by Cosmetic Bioglitter Red 008 – yellow line on the chart) passes the 90% criteria for the biodegradation requirement of *OK biodegradable WATER* after only 28 days, well within the 56 day test period.
 - Cosmetic Bioglitter™ Pure also meets the ecotoxicity and heavy metals criteria for *OK biodegradable WATER* certification.
- Fresh water is considered less aggressive or in other words a more difficult environment for biodegradation compared to soil, waste water, home compost and industrial composting conditions. We can therefore reasonably expect Bioglitter™ to biodegrade favorably in these more aggressive environments.

Summary

The specialised modified regenerated cellulose film used in Bioglitter™ and unique to Bioglitter™ offers the best chance by far of biodegradation in the natural environment compared to alternative glitter film technologies based on PLA, Cellulose Acetate and Cellophane™. This is demonstrated in the PLA based glitter c.0% biodegradation result in fresh water testing and lack of even EN13432 (industrial compostable) accreditation for Cellophane™ films.

Cosmetic Bioglitter™ Pure readily biodegrades in the fresh water test and meets the biodegradation and Ecotoxicity criteria for OK biodegradation WATER certification. As a result it is now fully certificated *OK biodegradable WATER* by TÜV and the serial marked logo can be used alongside the Cosmetic Bioglitter™ PURE products range.



The results show that the coating applied in the production of Cosmetic Bioglitter™ Sparkle has a very limited effect on rate of biodegradation compared to just the modified regenerated cellulose core film (the main raw material in Bioglitter™). As the last bit of remaining synthetic polymer in the coating is further reduced on the Cosmetic Bioglitter™ Sparkle development journey, we fully expect to meet *OK biodegradable WATER* certification criteria.

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