

Bio-Based VPP Photopolymers: Content Claims, Analytical Verification and End-of-Life Boundaries

Separating feedstock declarations, bio-based carbon measurements and biodegradation evidence

Dr. Juan Segurolo, founder and Scientific Director · 3Dresyns by Resyner Technologies S.L. · General Etxague 15B, 20003 Donostia / San Sebastián, Gipuzkoa, Spain · info@3dresyns.com · www.3dresyns.com

Highlights

- Bio-derived formulation mass, total bio-based content and bio-based carbon are different metrics.
- Every percentage is labelled as declared or measured, with calculation basis, specimen state and report.
- Radiocarbon results do not establish biodegradability, compostability or overall environmental benefit.
- The reported day-60 result after Liquefier treatment is not called ready biodegradable.
- Wavelength compatibility and end-of-life claims remain grade- and protocol-specific.

Abstract

Bio-based content and biodegradation describe different material attributes and require different evidence. The portfolio contains grades with declared bio-derived fractions across several mechanical and processing envelopes; every percentage needs an identified basis.

Radiocarbon methods quantify bio-based carbon under defined calculation rules. They do not automatically measure total bio-derived mass or establish life-cycle superiority, ecolabel eligibility or biodegradation.

The BioDeg Corn documentation reports a day-60 biodegradation result following Liquefier pre-treatment. It is presented only as a product- and protocol-specific result pending the full laboratory record and is not converted into ready-biodegradable, compostable or wastewater-acceptance language.

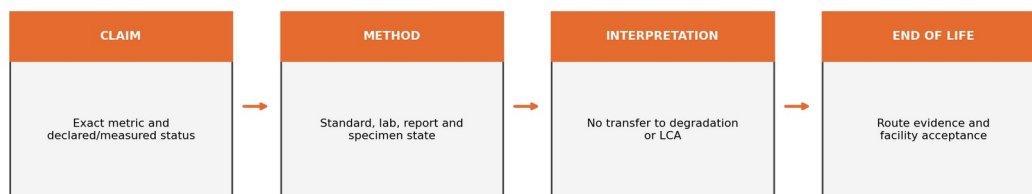
Keywords bio-based content · bio-based carbon · ASTM D6866 · ISO 16620 · biodegradation · life cycle

Source use. Product declarations and reports are controlled in [1]; analytical and biodegradation methods in [2–5]; sustainability context in [6].

1. Evidence hierarchy for content claims

A controlled data row identifies product, declared or measured status, quantity, basis, method, laboratory, report, specimen state, result and uncertainty. Untested formulation declarations are labelled declared and are kept visually separate from analytical measurements.

- Do not interchange mass fraction and bio-based carbon.
- Do not infer environmental superiority from feedstock origin.
- Tie procurement or ecolabel statements to a named programme and final product.



Release requires traceable evidence at every gate; a catalogue label cannot bypass the chain.

Figure 1. WP-16 evidence gates from controlled material description to final acceptance.

2. Biodegradation and treatment evidence

The identity and preparation of the test item, Liquefier conditions, inoculum, duration, controls, validity criteria and time-resolved results are required. A day-60 endpoint under an adapted protocol is not an official OECD extension or a ready-biodegradability classification.

- Report the measured endpoint and conditions only.
- Keep untreated and pre-treated articles separate.
- Assess the treatment material and resulting mixture in the end-of-life route.

3. End-of-life and printing boundaries

OECD 301 evidence does not establish industrial or home compostability, soil or marine behaviour, wastewater acceptance or complete life-cycle performance. Printer compatibility must be reported for the exact formulation and validated wavelength; a universal 150–420 nm statement is not retained.

4. Minimum controlled evidence before release

Control field	Required record	Release interpretation
Claim	Exact metric and declared/measured status	Catalogue description only until evidence is linked
Method	Standard, lab, report and specimen state	Control process variables and change triggers
Interpretation	No transfer to degradation or LCA	Report method, result, uncertainty and limits
End of life	Route evidence and facility acceptance	Apply final acceptance and responsibility boundary



Description ≠ measured result ≠ certification or finished-device approval

Figure 2. WP-16 separates catalogue positioning, measured evidence and final application decisions.

KEY INSIGHT

Precise product or application language is retained only when the exact formulation, method, processed specimen and controlled evidence can be traced.

5. Limitations

- Bio-based carbon and total bio-derived mass are not interchangeable.
- Feedstock origin does not establish biodegradability or lower life-cycle impact.
- The day-60 result applies only to the disclosed treated test item.
- No compostability or wastewater claim follows from OECD 301 alone.
- Printer wavelength compatibility is grade-specific.

6. Conclusions

- Bio-derived formulation mass, total bio-based content and bio-based carbon are different metrics.
- Every percentage is labelled as declared or measured, with calculation basis, specimen state and report.
- Wavelength compatibility and end-of-life claims remain grade- and protocol-specific.
- This corrected candidate remains local and on HOLD until series-wide scientific, metadata and visual release checks are complete.

Revision note

Version 5.5 separates declared bio-derived mass from measured bio-based carbon, removes automatic ASTM/Ecolabel and ready-biodegradability conclusions, and confines the day-60 statement to the defined pre-treated test item.

Acknowledgements. The author acknowledges the 3Dresyns technical team and users whose manufacturing experience informed this correction.

Disclosure. Dr. Juan Segurola is founder and Scientific Director of 3Dresyns by Resyner Technologies S.L., the supplier of the materials discussed.

References

- [1] 3Dresyns. Current product-specific content declarations, analytical reports and BioDeg Corn/Liquefier test record.
- [2] ASTM D6866. Standard Test Methods for Determining the Biobased Content of Solid, Liquid, and Gaseous Samples Using Radiocarbon Analysis; current controlled edition to be confirmed at release.
- [3] ISO 16620-2:2019. Plastics—Biobased content—Part 2: Determination of biobased carbon content.
- [4] EN 16640:2017. Bio-based products—Bio-based carbon content—Determination using the radiocarbon method.
- [5] OECD. Test No. 301: Ready Biodegradability, official method and pass criteria.
- [6] Maturi, M. et al. (2025). Sustainable approaches in vat photopolymerization. *Green Chemistry*, 27, 8710–8754. <https://doi.org/10.1039/D5GC02299A>