

Reactive Concentrates for Reinforced Photopolymer Composite Development

Ceramic, reinforced and tribological formulation routes with final-composite testing requirements

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Highlights

- Ten concentrates are listed as formulation routes, not prevalidated final composites.
- Adding a concentrate creates a new formulation; regulatory classes are not inherited or combined.
- Final loading, dispersion, sedimentation, cure and properties require direct measurement.
- Feldspar or another filler identity does not place a material within ISO 4049 scope.
- Dental, food-contact and biological outcomes require evidence for the final cured composite/article.

Abstract

Reactive concentrates provide routes for ceramic-, mineral-, reinforced- and tribological photopolymer composite development. They are intermediate formulation components rather than ready-to-use final products.

Adding a concentrate can change viscosity, dispersion, sedimentation, cure, shrinkage, mechanics, extractables, migration and biological response. The final cured composite must be characterized under intended processing and use conditions.

Regulatory classification belongs to the finished device or article and is not inherited from the base resin, filler or concentrate. ISO 4049 applies only to final products within its restorative/luting scope.

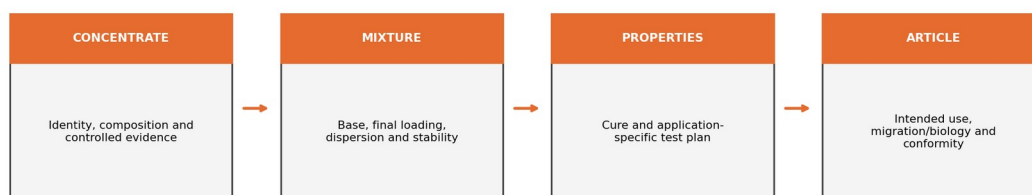
Keywords reactive concentrate · photopolymer composite · filler · dispersion · cure · final composite

Source use. Product evidence is controlled in [1]; composite/photopolymer context in [2–3]; dental, biological and mechanical methods in [4–6].

1. From concentrate to final formulation

The record distinguishes concentrate composition/loading from its final concentration after mixing. Product count or filler identity is not evidence of composite performance.

- Record base, concentrate, ratio and mixing method.
- Verify dispersion and sedimentation over the use window.
- Recalibrate cure and dimensional response.



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

Figure 1. WP-24 evidence gates from controlled material description to final acceptance.

2. Final-composite testing

Testing is selected from the intended function and failure modes: rheology, cure, shrinkage, mechanical/thermal behaviour, wear, friction, chemical resistance, migration, extractables or biological response.

- Use processed specimens representative of production.
- State methods, conditioning and uncertainty.
- Define acceptance criteria before testing.

3. Dental and regulated-use boundary

A polymer composite containing feldspar is not automatically a dental ceramic or clinical material. Dental and biological claims require exact intended use and final-composite evidence.

4. Minimum controlled evidence before release

Control field	Required record	Release interpretation
Concentrate	Identity, composition and controlled evidence	Catalogue description only until evidence is linked
Mixture	Base, final loading, dispersion and stability	Control process variables and change triggers
Properties	Cure and application-specific test plan	Report method, result, uncertainty and limits
Article	Intended use, migration/biology and conformity	Apply final acceptance and responsibility boundary

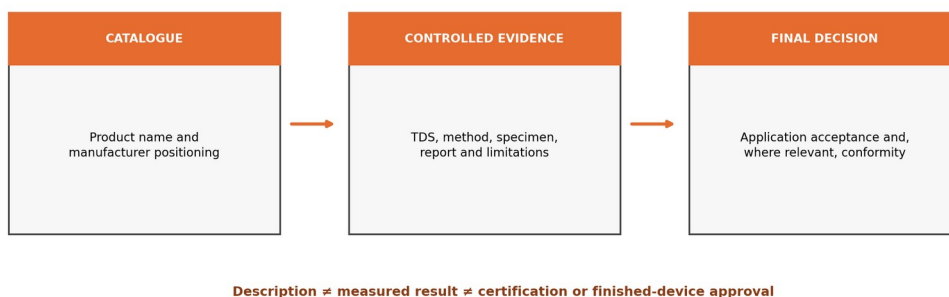


Figure 2. WP-24 separates catalogue positioning, measured evidence and final application decisions.

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

- Concentrates do not carry regulatory classes.
- Filler identity does not establish ISO 4049 scope.
- Listed does not mean every property is verified.
- Base-resin evidence is not automatically preserved.
- Final-composite testing is mandatory.

6. Conclusions

- Ten concentrates are listed as formulation routes, not prevalidated final composites.
- Adding a concentrate creates a new formulation; regulatory classes are not inherited or combined.
- Dental, food-contact and biological outcomes require evidence for the final cured composite/article.
- This corrected candidate remains local and on HOLD until series-wide scientific, metadata and visual release checks are complete.

Revision note

Version 5.3 removes regulatory-class inheritance and automatic dental/biological claims, replaces verified concentrates with listed routes and introduces complete final-composite validation.

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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 concentrate-specific TDS/SDS and controlled final-composite reports.
- [2] Ligon, S. C. et al. (2017). Polymers for 3D printing and customized additive manufacturing. <https://doi.org/10.1021/acs.chemrev.7b00074>
- [3] Bagheri, A., & Jin, J. (2019). Photopolymerization in 3D printing. <https://doi.org/10.1021/acsapm.8b00165>
- [4] ISO 4049:2019. Dentistry—Polymer-based restorative materials.
- [5] ISO 10993-1:2025. Biological evaluation of medical devices—Part 1.
- [6] ISO 178:2019. Plastics—Determination of flexural properties.