

Two-Photon Polymerization Materials for Nano- and Microfabrication

Mechanical, sacrificial and research-grade formulation routes with system-specific validation

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Highlights

- Performance depends on the complete laser, optics, scan, formulation, development and measurement system.
- Wavelength and feature claims are product- and optical-system-specific.
- Macroscale mechanical values are not presented as micro/nanoscale feature properties.
- Bio/additive labels do not establish biological suitability of the final formulation.
- Cell and scaffold uses remain research implementations requiring biological-model validation.

Abstract

The 2PP portfolio contains base formulations, sacrificial materials and auxiliaries intended for micro- and nanofabrication.

Mechanical values, wavelength compatibility, dosage and feature size require exact formulation, laser, optics, scan, development and measurement conditions. Platform-wide ranges are not retained without controlled evidence.

Research uses involving cells or tissues require evaluation of the printed/developed structure, extractables and device function in the intended model.

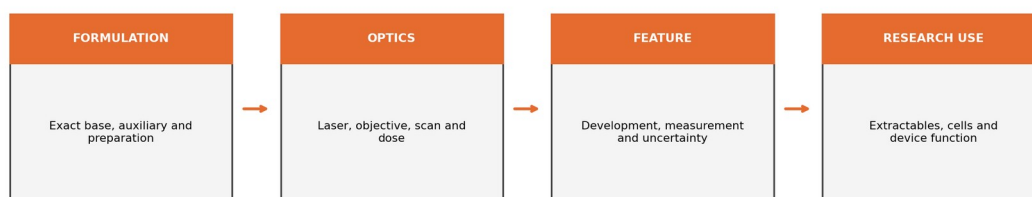
Keywords two-photon polymerization · 2PP · microfabrication · nanofabrication · research material

Source use. Product evidence is in [1]; 2PP and photopolymer context in [2,5]; biological/AM scope and related research controls in [3–4,6].

1. Optical-system record

The record includes wavelength, pulse characteristics, objective, numerical aperture, scan strategy, dose, voxel/feature definition and measurement.

- Identify exact formulation/additive.
- Separate voxel estimate from measured feature.
- Report substrate and development.



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

Figure 1. WP-32 evidence gates from controlled material description to final acceptance.

2. Scale-specific mechanics

Macroscale TDS modulus or hardness cannot be assigned to nanoscale features without scale-appropriate measurement and specimen definition.

- State test scale and method.
- Avoid incompatible envelope ratios.
- Validate ageing and environment.

3. Research/biological boundary

Scaffold and cell-culture implementations are research candidates. Product-specific biological information cannot be generalized across the platform.

4. Minimum controlled evidence before release

Control field	Required record	Release interpretation
Formulation	Exact base, auxiliary and preparation	Catalogue description only until evidence is linked
Optics	Laser, objective, scan and dose	Control process variables and change triggers
Feature	Development, measurement and uncertainty	Report method, result, uncertainty and limits
Research use	Extractables, cells and device function	Apply final acceptance and responsibility boundary



Description ≠ measured result ≠ certification or finished-device approval

Figure 2. WP-32 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

- No universal 2PP wavelength range is claimed.
- No universal sub-micron resolution is claimed.
- Macroscale values do not define feature mechanics.
- Bio is not a biological-safety status.
- Research use is not clinical validation.

6. Conclusions

- Performance depends on the complete laser, optics, scan, formulation, development and measurement system.
- Wavelength and feature claims are product- and optical-system-specific.
- Cell and scaffold uses remain research implementations requiring biological-model validation.
- 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 the universal biocompatible platform, wavelength, modulus and resolution generalizations and adds system- and scale-specific evidence requirements.

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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

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