

Silicone-Like and PDMS-Like Photopolymers for Microfabrication

Material analogues for VPP, nanoimprint, microfluidic and two-photon workflows with application-specific validation boundaries

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Highlights

- PDMS-like describes selected measured behaviour; it does not imply PDMS chemistry or complete property equivalence.
- Grade selection requires named hardness, modulus, elongation, optical, surface, permeability and extractables data.
- Channel clearing depends on the material–printer–geometry–cleaning system, not a universal size threshold.
- Two-photon claims require exact laser, optics, exposure, voxel/feature and photoaccelerant data.
- Organ-on-chip and cell-culture uses are research candidates requiring final-device and biological-model validation.

Abstract

The silicone-like and PDMS-like portfolio contains photopolymer grades intended to reproduce selected elastomeric, optical, surface or processing attributes useful in nanoimprint, microfluidic and two-photon workflows. PDMS-like is a functional comparison and not a chemical-identity statement.

Selection should use measured properties of the exact grade and processed specimen. Surface-treatment compatibility, feature replication, permeability, adsorption, leachables and optical response can be as important as hardness or viscosity.

Biomedical research implementations require evaluation of the printed and post-processed device with the intended assay or cell model. Resolution and channel-clearing results must identify the complete printing and cleaning conditions.

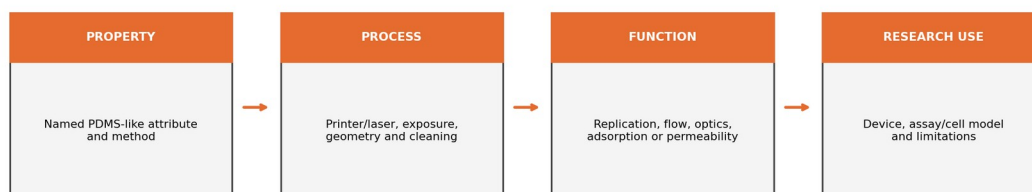
Keywords PDMS-like · silicone-like · microfluidics · nanoimprint · two-photon polymerization · organ-on-chip research

Source use. Product evidence is controlled in [1]; microfabrication and photopolymer background in [2–4,6]; the biological-evaluation boundary in [5].

1. Functional comparison, not equivalence

A PDMS-like label must be followed by the specific property being compared. Conventional PDMS and a cured photopolymer can differ in chemistry, gas permeability, swelling, adsorption, extractables, surface ageing and sterilisation response.

- Report hardness, modulus and elongation with method and conditioning.
- Report transmission and surface data at the use wavelength and state.
- Do not use biological inertness as a portfolio property.



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

Figure 1. WP-13 evidence gates from controlled material description to final acceptance.

2. Microfluidic and nanoimprint workflows

Channel clearing depends on cross-section, length, orientation, viscosity, pressure gradient, exposure and cleaning. Nanoimprint performance requires feature-replication, release, surface-treatment and cycle data for the exact formulation.

- Define minimum feature by a measured acceptance criterion.
- Verify adsorption, permeability and leachables where functionally relevant.

- Support FDTs or other anti-stiction claims with direct surface/replication data.

3. Two-photon and biomedical research boundary

Two-photon results require wavelength, pulse characteristics, objective, exposure strategy, voxel definition and exact resin/additive combination. Organ-on-chip membranes and cell-culture scaffolds remain research candidates until the complete device and biological model are validated.

4. Minimum controlled evidence before release

Control field	Required record	Release interpretation
Property	Named PDMS-like attribute and method	Catalogue description only until evidence is linked
Process	Printer/laser, exposure, geometry and cleaning	Control process variables and change triggers
Function	Replication, flow, optics, adsorption or permeability	Report method, result, uncertainty and limits
Research use	Device, assay/cell model and limitations	Apply final acceptance and responsibility boundary

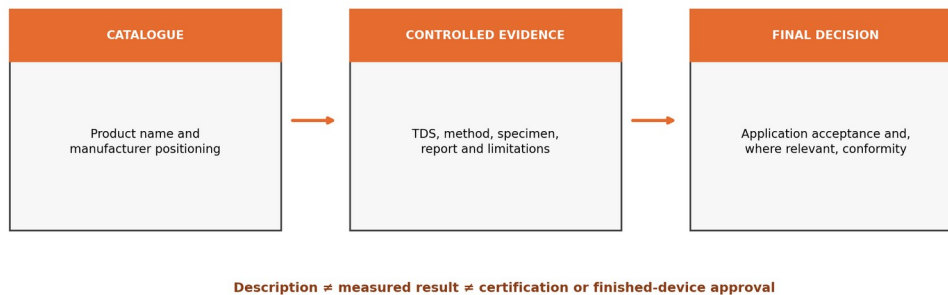


Figure 2. WP-13 separates catalogue positioning, measured evidence and final application decisions.

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

- PDMS-like does not establish chemical identity or complete equivalence.
- No general biological-inertness claim applies to the portfolio.
- Feature resolution cannot be inferred from wavelength or printer class alone.
- Organ-on-chip and cell-culture suitability requires final-device validation.
- ISO 10993 evidence is device-, contact- and risk-specific.

6. Conclusions

- PDMS-like describes selected measured behaviour; it does not imply PDMS chemistry or complete property equivalence.
- Grade selection requires named hardness, modulus, elongation, optical, surface, permeability and extractables data.
- Organ-on-chip and cell-culture uses are research candidates requiring final-device and 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 5.5 removes biological-inertness and full-PDMS-equivalence implications, universal channel-size and two-photon claims, and unqualified biomedical uses; it updates ISO 10993-1 to 2025.

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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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