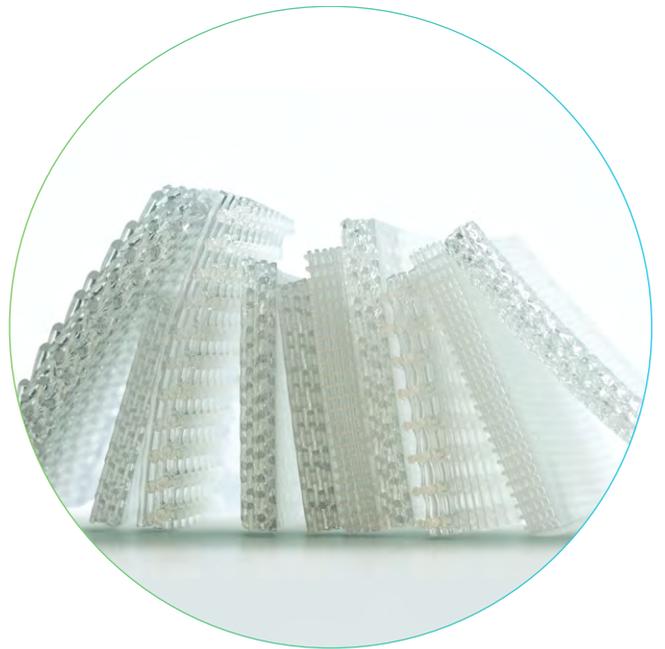


Liquid Silicone Rubber for additive manufacturing

Liquid Silicone Rubbers (LSRs) for additive manufacturing from NuSil® offer unique rheological properties for use in extrusion based additive manufacturing for a variety of applications. Historically, LSRs have been molded into parts, commonly through liquid injection molding. Printable LSRs allow for lab scale prototyping of complex geometries without compromising on the physical properties of the resulting material. Low volume production of customized parts can also be achieved with our printable materials.



CURE CHEMISTRY

NuSil's printable LSRs are addition cured, 2-part systems that are optimized for low temperature vulcanization. This platinum curing chemistry does not produce volatile leaving groups and results in minimal shrinkage of the printed part. Additionally, no steps are needed after curing to remove byproducts. NuSil offers dimethyl and diphenyl LSR options with various physical properties.

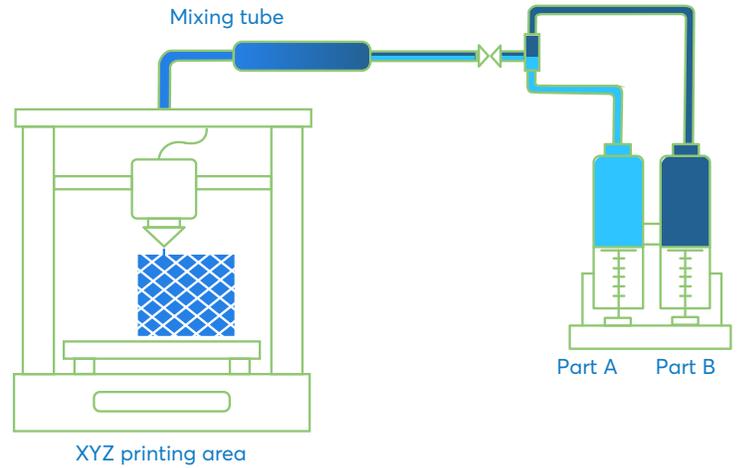


TABLE 1: TYPICAL UNCURED AND CURED PROPERTIES OF MATERIAL

Typical Properties	LSR-1	LSR-2
Uncured:		
Viscosity Part A	3,000,000 cP at 0.1 s ⁻¹ , 830,000 cP at 1 s ⁻¹	10,200,000 cP at 0.1 s ⁻¹ , 140,000 cP at 1 s ⁻¹
Extrusion Rate, Part A	8.27 g/min	9g/min
Viscosity Part B	710,000 cP at 0.1 s ⁻¹ , 120,000 cP at 1 s ⁻¹	7,200,000 cP at 0.1 s ⁻¹ , 1,150,000 cP at 1 s ⁻¹
Extrusion Rate, Part B	28.80 g/min	9g/min
Appearance:	Translucent	Translucent
Cured*: 30 min at 100 °C, 2 hours at 150°C		
Specific Gravity	1.10	1.13
Durometer, Type A	25	40
Tensile Strength	600psi (4.1 MPa)	1,000psi (6.9MPa)
Elongation	475%	520%

*Cured properties of standard molded slab

TABLE 2: TYPICAL CATALYZED PROPERTIES FOR PROCESSING

Typical Properties	LSR-1	LSR-2
Mixed (1:1 A:B Ratio)		
Viscosity	2,500,000 cP at 0.1 s ⁻¹ , 360,000 cP at 1 s ⁻¹	4,600,000 cP at 0.1 s ⁻¹ , 700,000 cP at 1 s ⁻¹
Yield Point (modulus crossover)	350 Pa	500Pa
Work Time	> 5 hours	72 hours
Cure Rate T90 m @ 80 °C	6 min	16 min
Cure Rate T90 m @ 100 °C	1.5 min	2 min

NuSil's printable LSR materials are in pilot lifecycle and available for sampling, allowing for quick commercialization or customization depending upon end-application requirements.



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