

GUIDE TO MATERIALS FOR 3D PRINTING AND PRE-SERIES

The development of additive manufacturing has made available to designers and users a variety of materials in which it is often difficult to navigate.

Let's try to shed some light with the help of this diagram, which focuses on the most used materials in various technologies: photosensitive polymers in stereolithography and multi-jet printing, nylon powder in sintering and multi-jet casting, the traditional thermoplastic in wire extrusion.

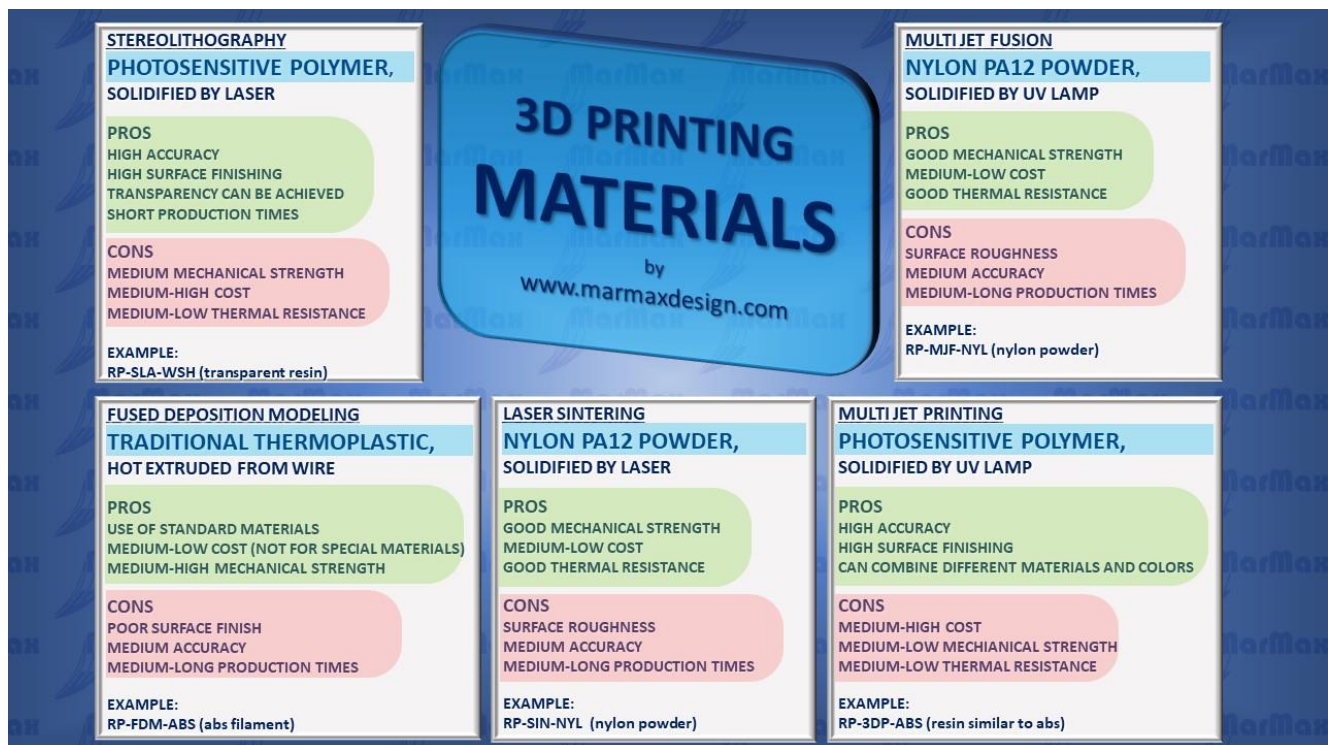


Figure 1: Outline of the most used materials in 3D printing

The following table summarizes the characteristics of the most used materials in 3D printing. The green color indicates a good level of the indicated property, the gray color indicates that the material is not very suitable or does not possess the indicated characteristic, the yellow color represents an intermediate situation (acceptable, not excellent). Obviously the table is not exhaustive of all the materials, but is intended to guide the choice, according to the most relevant needs of the user.

3D printing materials

Material	Dimensional accuracy	Surface finish	Transparency	Paintability	Mechanical resistance	Thermal resistance	Flexibility	Cost	Notes and applications
RP-SLA-WSH	Green	Green	Green	Green	Yellow	Yellow	Yellow	Green	Functional prototypes with optimal aesthetic characteristics
RP-SIN-NYL	Yellow	Yellow	Gray	Green	Green	Green	Green	Green	Functional prototypes with good mechanical characteristics
RP-MJF-NYL	Yellow	Yellow	Gray	Green	Green	Green	Green	Green	Functional prototypes with good mechanical characteristics
RP-FDM-ABS	Yellow	Gray	Gray	Yellow	Green	Green	Green	Yellow	Prototypes in traditional thermoplastic material (but without the same mechanical and aesthetic characteristics)
RP-3DP-ABS	Green	Green	Gray	Yellow	Green	Yellow	Green	Yellow	Ability to digitally combine different polymers to generate different hardnesses (even elastomers)

	unsuitable / not recommended
	average / indifferent
	unsuitable / not recommended

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Figure 2: Comparison of the characteristics of some 3D printing materials

Moving from 3D printing to vacuum casting, we are again faced with a wide range of materials, which can be used for pre-series production. In this case the constructive solution is the same for all, it is the vacuum casting of bicomponent polyurethane in a silicone mold. The wide range of formulations available for polyurethanes makes it possible to satisfy the most varied needs, which we have tried to summarize in this diagram.



Figure 3: Outline of pre-series materials

The following table summarizes the characteristics of the materials available for the vacuum casting of pre-series, highlighting merits and demerits of the various materials, with the color legend already illustrated above, green for good characteristics of the indicated property, grey if the material is not very suitable or does not possess the indicated property, yellow for an intermediate situation.

Pre-series materials for vacuum casting

Material	Flexibility	Impact strength	Mechanical resistance	Thermal resistance	Chemical resistance	Tensile strength	Transparency	Colorability	Cost	Notes and applications
RS-00205-X	Green	Yellow	Yellow	Yellow	Green	Green	Grey	Yellow	Grey	similar to PP, high elongation
RS-00212-X	Green	Yellow	Yellow	Yellow	Yellow	Yellow	Grey	Green	Yellow	similar to PP
RS-00223-A	Yellow	Green	Yellow	Green	Yellow	Yellow	Grey	Grey	Green	similar to black ABS
RS-00225-X	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Green	Green	Green	similar to colored or transparent ABS
RS-00225-A	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Green	Green	similar to colored ABS
RS-00226-X	Yellow	Green	Green	Yellow	Yellow	Yellow	Grey	Green	Yellow	similar to filled ABS, PA6
RS-00234-X	Grey	Yellow	Yellow	Green	Yellow	Yellow	Grey	Yellow	Grey	for high temperature (200°C)
RS-00245-X	Green	Yellow	Green	Yellow	Yellow	Grey	Grey	Yellow	Yellow	similar to filled PA6
RS-01000-X	Green	Yellow	Yellow	Yellow	Yellow	Yellow	Grey	Yellow	Green	similar to PP
RS-08241-X	Grey	Grey	Grey	Yellow	Yellow	Grey	Green	Green	Yellow	transparent, UV resistant
RS-03450-X	Green	Green	Yellow	Yellow	Green	Green	Grey	Grey	Yellow	hard rubber (Sh 80), hydrolysis resistant
RS-05825-X	Green	Green	Yellow	Yellow	Yellow	Green	Grey	Yellow	Green	very soft rubber (Sh30)
RS-08400-X	Green	Green	Yellow	Yellow	Yellow	Green	Grey	Green	Yellow	rubber with variable hardness

very good / recommended
 average / indifferent
 unsuitable / not recommended

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Figure 4: Comparison of some materials used in pre-series

The detailed technical data sheets of the materials mentioned in these tables are available on our website, at this link: <https://www.marmaxdesign.com/en/technologies/datasheets>.