

The Free Beginner's Guide

04 :
PROCESSES

06 : GLOBAL
EFFECTS

3D Printing Materials :

The materials available for 3D printing have come a long way since the early days of the technology. There is now a wide variety of different material types, that are supplied in different states (powder, filament, pellets, granules, resin etc).

Specific materials are now generally developed for specific platforms performing dedicated applications (an example would be the dental sector) with material properties that more precisely suit the application.

However, there are now way too many proprietary materials from the many different 3D printer vendors to cover them all here. Instead, this article will look at the most popular types of material in a more generic way. And also a couple of materials that stand out.

Plastics

Nylon, or Polyamide, is commonly used in powder form with the sintering process or in filament form with the FDM process. It is a strong, flexible and durable plastic material that has proved reliable for 3D printing. It is naturally white in colour but it can be coloured – pre- or post printing. This material can also be combined (in powder format) with powdered aluminium to produce another common 3D printing material for sintering – Alumide.



ABS is another common plastic used for 3D printing, and is widely used on the entry-level FDM 3D printers in filament form. It is a particularly strong

plastic and comes in a wide range of colours. ABS can be bought in filament form from a number of non-proprietary sources, which is another reason why it is so popular.

PLA is a bio-degradable plastic material that has gained traction with 3D printing for this very reason. It can be utilized in resin format for DLP/SL processes as well as in filament form for the FDM process. It is offered in a variety of colours, including transparent, which has proven to be a useful option for some applications of 3D printing. However it is not as durable or as flexible as ABS.

LayWood is a specially developed 3D printing material for entry-level extrusion 3D printers. It comes in filament form and is a wood/polymer composite (also referred to as WPC).

Metals

A growing number of metals and metal composites are used for industrial grade 3D printing. Two of the most common are aluminium and cobalt derivatives.



One of the strongest and therefore most commonly used metals for 3D printing is Stainless Steel in powder form for the sintering/melting/EBM processes. It is naturally silver, but can be plated with other materials to give a gold or bronze effect.

In the last couple of years Gold and Silver have been added to the range of metal materials that can be 3D printed directly, with obvious applications across the jewellery sector. These are both very strong materials and are processed in powder form.

Titanium is one of the strongest possible metal materials and has been used for 3D printing industrial applications for some time. Supplied in powder form, it can be used for the sintering/melting/EBM processes.

Ceramics

Ceramics are a relatively new group of materials that can be used for 3D printing with various levels of success. The particular thing to note with these materials is that, post printing, the ceramic parts need to undergo the same processes as any ceramic part made using traditional methods of production – namely firing and glazing.



Paper

Standard A4 copier paper is a 3D printing material employed by the proprietary SDL process supplied by Mcor Technologies. The company operates a notably different business model to other 3D printing vendors, whereby the capital outlay for the machine is in the mid-range, but the emphasis is very much on an easily obtainable, cost-effective material supply, that can be bought locally. 3D printed models made with paper are safe, environmentally friendly, easily recyclable and require no post-processing.



Bio Materials

There is a huge amount of research being conducted into the potential of 3D printing bio materials for a host of medical (and other) applications. Living tissue is being investigated at a number of leading

institutions with a view to developing applications that include printing human organs for transplant, as well as external tissues for replacement body parts. Other research in this area is focused on developing food stuffs – meat being the prime example.



Food

Experiments with extruders for 3D printing food substances has increased dramatically over the last couple of years. Chocolate is the most common (and desirable). There are also printers that work with sugar and some experiments with pasta and meat. Looking to the future, research is being undertaken, to utilize 3D printing technology to produce finely balanced whole meals.



Other

And finally, one company that does have a unique (proprietary) material offering is Stratasys, with its digital materials for the Objet Connex 3D printing platform. This offering means that standard Objet 3D printing materials can be combined during the printing process – in various and specified concentrations – to form new materials with the required properties. Up to 140 different Digital Materials can be realized from combining the existing primary materials in different ways.