

Nanoe Launches Zetamix[®], a New Line of Ceramic and Metal 3D-Printing Filaments

Following its strategy to develop new raw materials for ceramic 3D-printing, Nanoe is launching Zetamix[®], a line of filaments for Ceramic Filament Manufacturing (CFM), and Metal Filament Manufacturing (MFM).



Fig. 1
Ceramic Filament Manufacturing

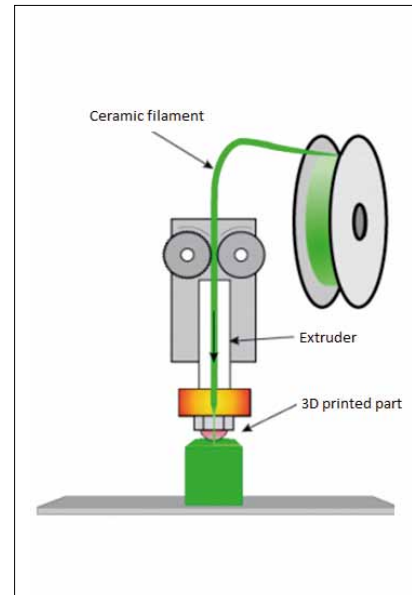


Fig. 2
Filament 3D-printing

“We see exciting possibilities for Zetamix[®]” says Guillaume de Calan, CEO of Nanoe. “CFM is a very affordable way to make ceramic 3D-printed parts. With a very low investment, our customers will be able to start producing some parts, and learn to use this technology.”

Zetamix[®] are filaments constituted of a polymer matrix and a ceramic or metal powder (between 50–60 vol.-%), which can be used in any FDM 3D-printer. The 3D-printed shape is afterwards debinded and sintered in the same processes as Powder Injection Moulding (PIM).

Keywords
ceramic filament manufacturing

Filament 3D-printing is a technology which uses a thermoplastic filament as a raw material.

This filament is pushed through a heated nozzle, which will deposit the melted material layer by layer. FDM is the most widely spread method of 3D-printing in the world, with more than 1 million machines already installed, and a new 400 000 machine sold just in 2017. Zetamix[®] filaments are designed to be compatible with all these printers, with little or no adaptation needed.

New possibilities

This new technology for ceramic 3D-printing has a few key advantages which should

make it complementary to other processes. Some key features are as follows:

- Low cost investment, desktop machines;
- Wide range of materials;
- Fully dense materials;
- Possibility to print closed porosity, no washing of the part needed;
- Fast prints;
- Multi-material possibility;
- Possibility to print fibre-reinforced ceramics.

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A wide range of materials

The first filaments to be produced are based on Nanoe proprietary material: Al100 alumina, 3Y-TZP zirconia, ZTA10 zirconia toughened alumina and black zirconia. These filaments are already available for testing.

However, one of the main advantage of this technology is the capacity to use a wide range of material, and Nanoe’s development program include other ceramics, such as SiC, SiN, WC–Co, and also some metal materials: stainless steel 316L, inconel, titanium. These new materials will be released progressively during end of 2018 and 2019.

Promising applications

As with other 3D-printing technique, this new technology will need to go through some validation steps before being used on real case applications, and will be going first in prototyping, rapid tooling, and then in some actual parts. Indeed, the first customers to try this new technology are ceramic manufacturing companies, especially companies using Ceramic Injection Molding (CIM), for prototyping purposes. Nanoe has also started some trials for different ceramic tools and insert, and see some potential in ceramic cores for investment casting. The technology will also be developed in order to be able to print multi-material parts, which could have interest in luxury (multi coloured ceramics), aerospace (with high temperature cofired ceramics) and defense. Lightweight ceramic parts with optimised internal structure also seem to be a promising application.

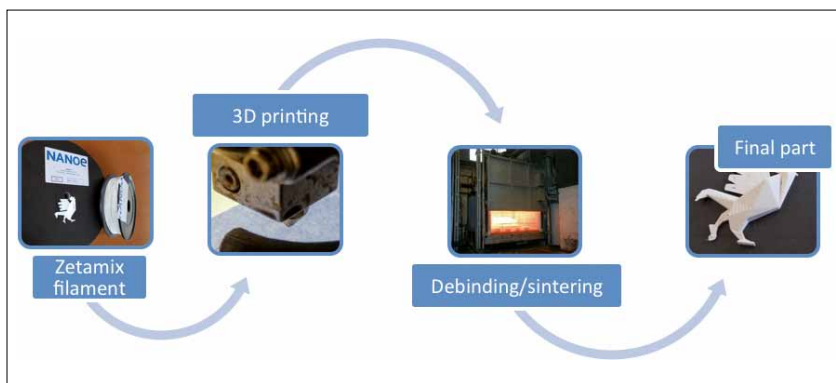


Fig. 3 Zetamix® process flow

Nanoe already prints a few parts with honeycomb internal patterns, which allows to produce high strength parts with very low densities. Potential applications could be found in aerospace, defense, automotive, etc.

Zetaprint® on demand

In order to help the customer adopt this new technology in house, Nanoe has also launched a 3D-printing service for demonstration pieces and small quantity production. “This service is seen as a necessary step to check the compliance of our process with our customer objectives before investing in a machine” says Guillaume de Calan, “we can deal with the full process flow strating from STL file to a 3D-printed and sintered part, with some finishing if necessary”. Once the parts are validated, Nanoe will then transfer the know-how to the customer. Nanoe sees a great potential for this technology, and is looking for col-

laborations with machine manufacturers, end-users, potential customers and laboratories to develop it and find applications.

Tab. 1

Available Materials	Materials in Development	
	Material	Availability
Alumina	Innox 316 L	Dec. 2018
Zircona	WC–Co	Dec. 2018
ZTA	Titane	...
Black Zircona	SiC, Si ₃ N ₄	...

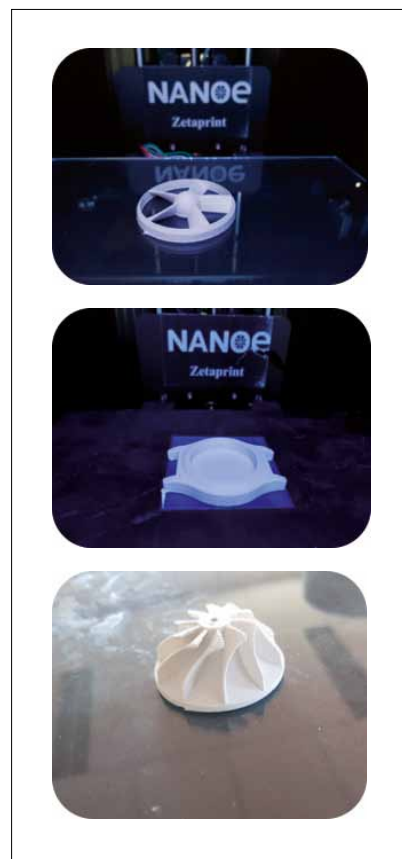


Fig. 4 Example of parts printed by Nanoe for demonstration purposes