



Ceramics

Additive Manufacturing Opportunities in 2018–23



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The Final Frontier of AM

Few materials in the world of manufacturing offer as wide a range of applications as ceramics.

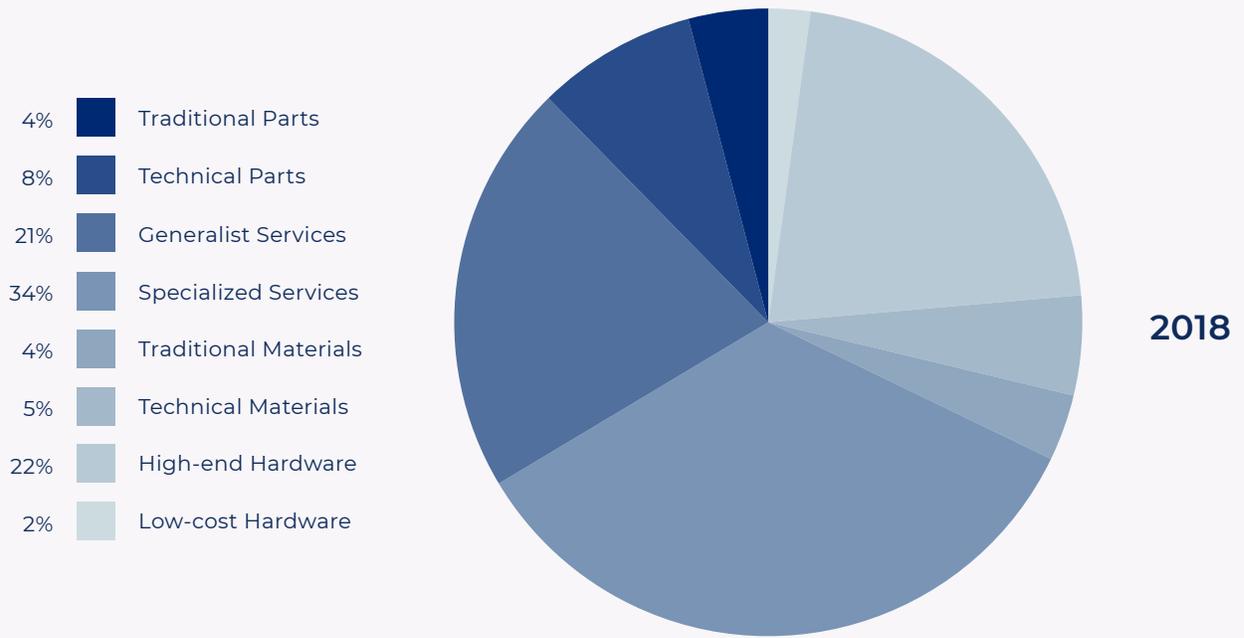
When it comes to additive manufacturing, the wide range of ceramic applications and material types is further expanded by the even wider range of different ceramics additive manufacturing processes that have been—and are continuously—researched, validated and implemented in ceramic manufacturing.

Ceramics additive manufacturing has been studied for close to two decades (almost as long as AM has existed) and while it has shown great promise from the very beginning only very

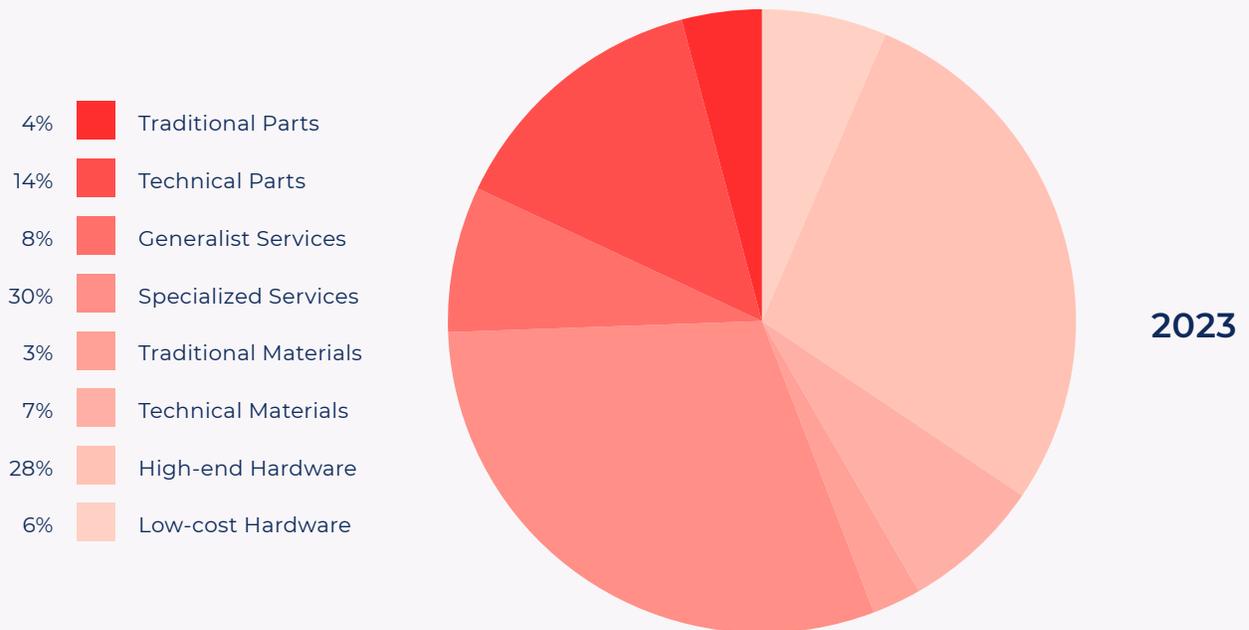
recently have the first real, practical and commercial applications of ceramics 3D printing begun to emerge.

With all digital AM processes for ceramic production, indeed as with all traditional ceramics production, the printed parts must undergo considerable post-processing before reaching their desired mechanical and chemical properties and final-part density. In essence, photopolymerization processes first require debinding in order to remove the polymer, and then all technologies require the parts to be sintered — unless, of course, you're printing sand molds and cores for metal casting.

Ceramics AM Market Share by Segment



Source: Smartech Publishing



Source: Smartech Publishing

“We expect ceramics AM adoption to experience an inflection point after 2025 as all major AM technologies that support ceramics production come to maturity and enjoy a sufficient presence in the market to support serial part production”

Whilst these additional steps make 3D printing in ceramics — from digital file to final part — a somewhat slower process than other AM technologies for other materials, these steps are also required when using traditional manufacturing techniques. And considering the advantages that AM brings compared to traditional techniques — such as design freedom, complex geometries, full customization (particularly in biomedical applications), low-to-zero material waste, and lower costs on low-volume production — then, on balance, ceramics is already establishing itself as a relevant important and profitable section of the AM industry.

We now project that the ceramics 3D printing market will generate overall revenues for over **\$3.6 billion yearly** within a decade, driven by strong CAGR in end-use part production and more generally by application revenues and

hardware revenues. In 2018, the ceramics 3D printing market is focusing on AM part production, benefiting from the experience acquired by adopters and system OEM's working with metal and polymer technologies. Ceramics AM, however, presents a distinct set of advantaged and challenges. Mid-term growth is expected to be strong taking the overall ceramics AM market from to (including application revenues).

Leading players in this segment are **Lithoz, 3D Ceram Sinto, Admatec, Prodways, Tethon 3D, 3D Systems, Kwambio, voxeljet, ExOne, HP, Johnson Matthey, Nanoe, XJet**, and several more. Companies developing materials and providing ceramic AM services or specific applications have come to understand that additive manufacturing's extreme geometric capabilities are proving ideal for

the production of complex ceramic parts in all major ceramic adoption segments. These include the aerospace, automotive, marine, energy, electronics, medical, dental and biomedical segments, which are already among the first adopters of AM technologies.

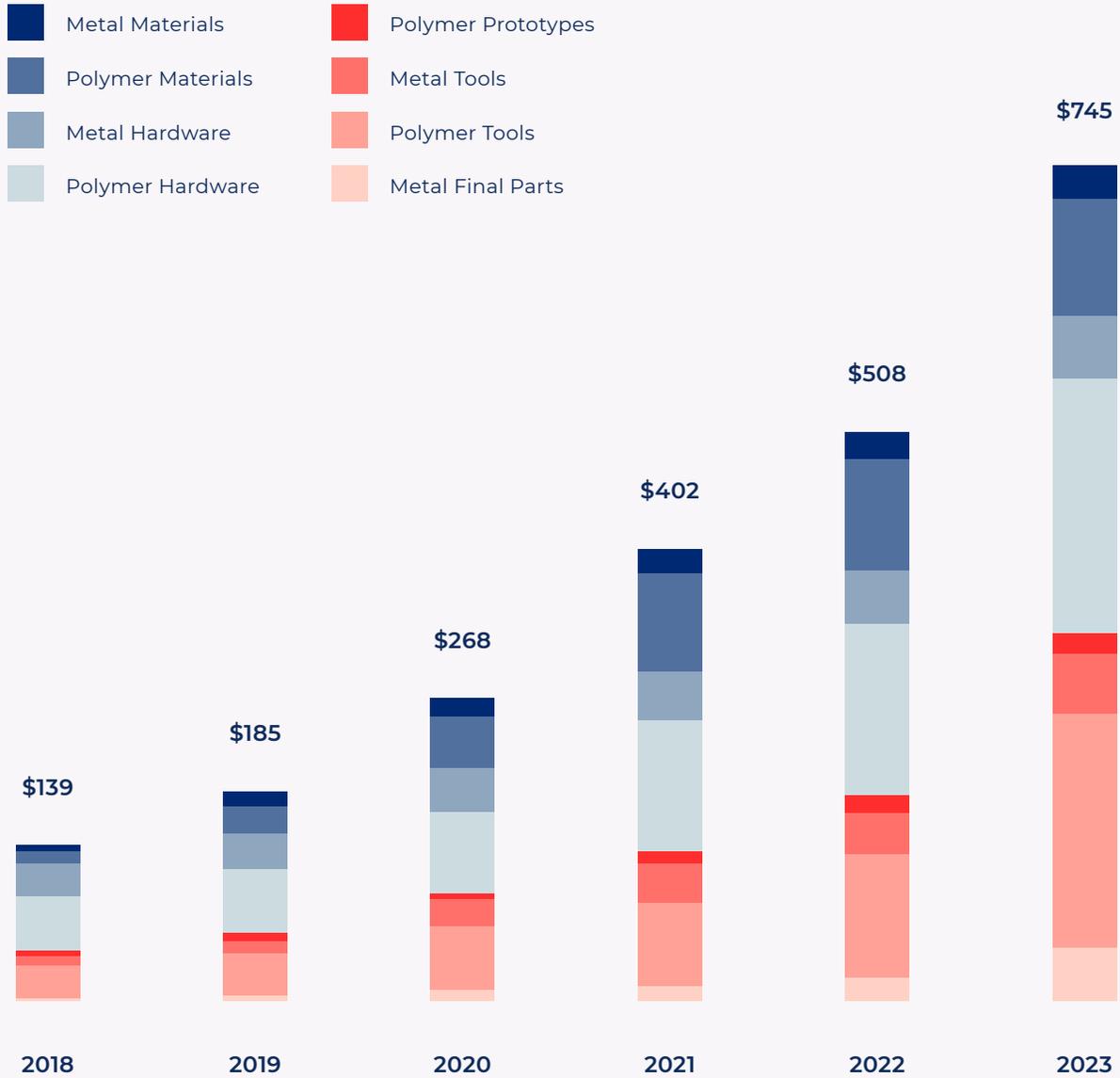
In our forecasted timeline we expect ceramics AM adoption to experience an **inflection point after 2025** as all major AM technologies that support ceramics production come to maturity and enjoy a sufficient presence in the market to support serial part production. We are currently forecasting that this shift will be driven by imitating and benefiting from the experience of powder metal additive manufacturing. In particular, the adoption of **CIM-** (ceramics injection molding) based additive manufacturing processes is expected to drive larger batch production in the same way as MIM- (metal injection molding) based additive processes are now expected to significantly expand AM adoption and throughput capabilities, lowering costs.

Final parts value for both technical and traditional ceramic parts are expected to represent the most significant opportunities driving the market for the

medium to long-term future. Compared to relatively low revenues generated by technical and traditional ceramic materials, this trend indicated that in ceramics AM more than in any other material family, the primary “value is in the process”. This means that that additively manufacturing a ceramic part increases the value of the material used to produce it several times.

Ceramics AM technologies are now largely available so perhaps the biggest challenge to address today is the creation of market demand. Many companies that produce ceramic components, especially advanced ceramic components, could be benefiting significantly from subassemblies and DfAM (Design for Additive Manufacturing) ceramic parts but in many cases still need to imagine, envision, design and develop the parts that will make ceramic AM processes and materials truly cost-effective.

Total Ceramics AM Market 2018-2023 (\$millions)



Source: Smartech Publishing

Full Report

[See Report](#)

In this second report from SmarTech Publishing on ceramics additive manufacturing, readers will learn about the most up to date market data and analysis of market trends at the professional and industrial level. The report breaks down the ceramics 3D printing opportunity across numerous user industries as well as different AM technologies, materials and material supports, part types and geographical market regions.

The report analyzes pros, cons and generated revenues of the dominant AM technologies for processing ceramics, both technical (advanced) and traditional (clay-like). These include material extrusion, photopolymerization

and binder jetting 3D printing technologies. Currently available high-end industrial system data are complemented by a deep analysis of new and emerging technologies such as low-cost hardware systems and new jetting processes. All analyses are supported with hardware and material market shipments, sales, installations, and future forecasts through 2028 to provide a fully comprehensive insight into the future of ceramic 3D printing.

SmarTech Publishing

A leading provider of industry analysis and market forecasts for the additive manufacturing industry. SmarTech Publishing's coverage provides insight to complement internal product planning and technology roadmapping, and provide low-cost knowledge enhancement for companies working in the AM industry.

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