3D PRINTING MATERIALS MARKET

BY PLASTICS (ABS, PLA, Nylon & Others), **BY METALS** (Steel, Titanium, Gold & Others), **BY CERAMICS** (Silica, Glass & Others), **BY OTHERS** (Laywood & Others), **BY FORMS & BY END-USER INDUSTRIES**

— Global Trends & Forecasts to 2018

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1 EXECUTIVE SUMMARY

The 3D printing materials market is driven by the ease of manufacturing objects at several industrial, commercial, and residential operations. 3D printing materials successfully provide support to develop required objects in several industries; especially in the aerospace and medical industries, their performance is unremarkable. As the need for new and advanced technologies has increased, the requirement for materials with different levels of characteristics is also increased. 3D printing materials with high process ability, flexibility, and stability, are the current revolution globally.

Key participants in the 3D printing materials market include 3D systems Inc. (U.S.), Stratasys Ltd. (U.S.), Oxford Performance Materials (U.S.), Arcam AB (Sweden), ExOne Gmbh (Germany), ARKEMA (France), and EOS Gmbh Electro Optical Systems (Germany), Voxeljet AG (Germany), Materialise NV (Belgium), DSM Desotech Inc (U.S.), and others.

TABLE 1

3D PRINTING MATERIALS MARKET CONSUMPTION, BY GEOGRAPHY, 2011-2018 (TONS)

Region	2011	2012	2013	2018	CAGR % (2013-2018)
North America	XX	XX	XX	XX	XX
Asia-Pacific	XX	XX	XX	XX	XX
Europe	XX	XX	XX	XX	XX
ROW	XX	XX	XX	XX	XX
Total	XX	XX	XX	XX	XX

Source: Secondary Research, Expert Interviews and MarketsandMarkets Analysis

The 3D printing materials market had a consumption of XX tons in 2012, with the highest share held by North America with XX%, followed by Asia-Pacific with XX%. The market is projected to grow at a CAGR of XX% from 2013 to 2018 to reach XX tons by 2018. The highest investment is forecasted to be in North America, due to growing application markets, low cost of production, and the availability of raw materials. The North America region is expected to grow at a rate of XX% from 2013 to 2018.

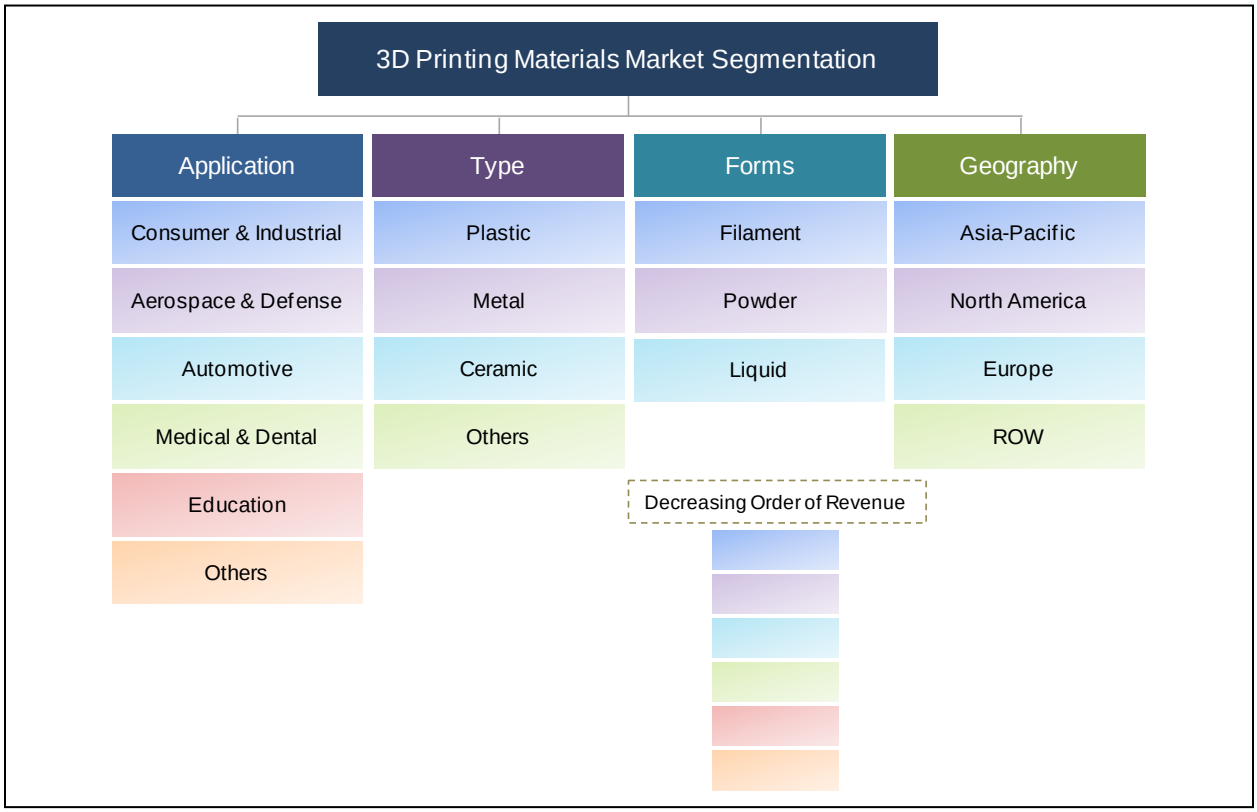
As of 2012, Asia-Pacific was the second major market, but is expected to dominate the North American market by 2018, at the highest growth of XX% from 2013 to 2018. Europe and North America are the major competitors in terms production, while in consumption, Europe occupied the third position and is expected to grow at CAGR of XX%. The ROW region would experience a growth of XX% from 2013 to 2018, reasoned by several factors that include the inundated demand in the end-user markets. This summarizes the scope, initiatives, and density of the 3D printing materials market in every major region of the world.

2 PREMIUM INSIGHTS

2.1 3DP MATERIALS MARKET SEGMENTS

FIGURE 1

3DP MATERIALS: MARKET SEGMENTS, BY APPLICATION, TYPE, FORMS, & GEOGRAPHY



Source: Expert Interviews, MarketsandMarkets Analysis

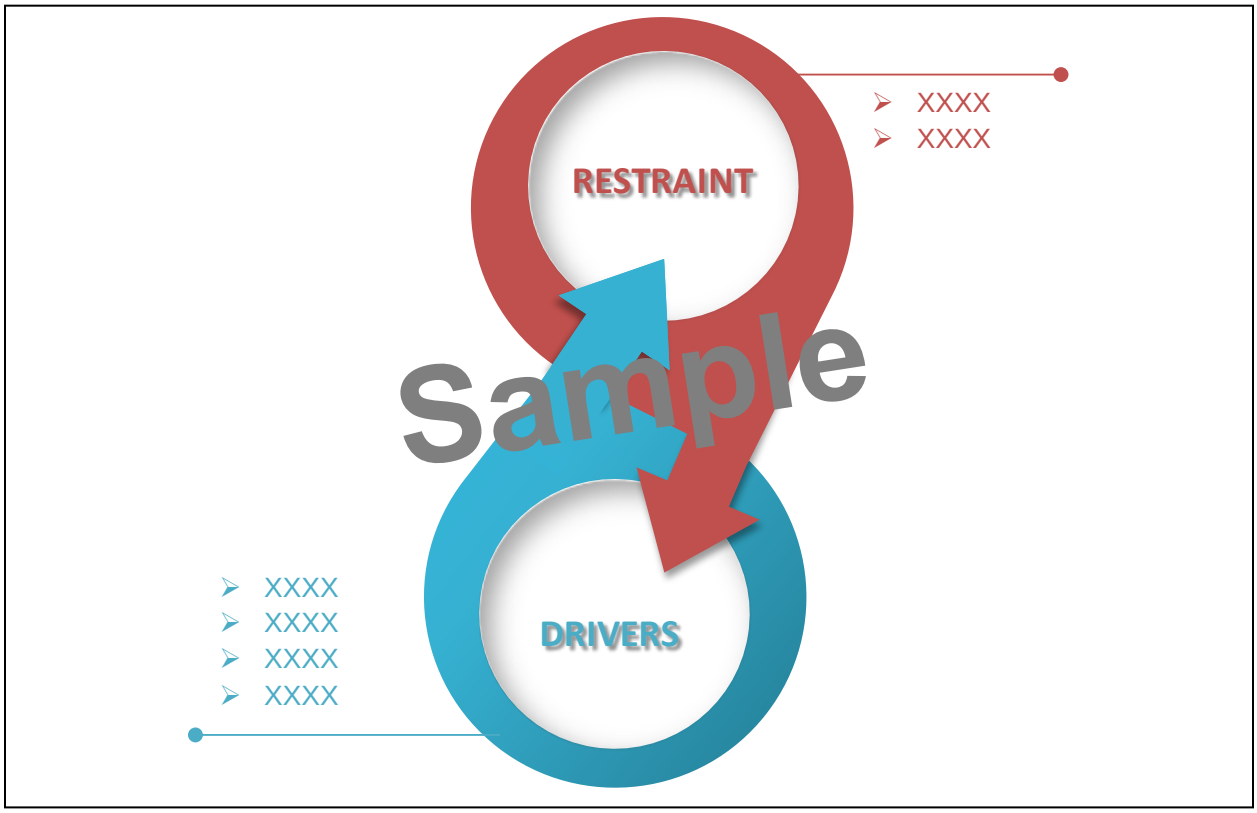
North America, Asia-Pacific, and Europe are the major markets of 3DP materials, in decreasing order of values that are generated by regions. Filament, powders, and liquids are the three types of 3DP materials. Consumer & industrial, aerospace & defense, automotive, medical &

dental, education, and others are the various end-user markets of 3DP materials. Geography, types, and applications are in the decreasing order of values generated by sub-segments.

2.2 3DP MATERIALS MARKET DYNAMICS

FIGURE 2

3DP MATERIALS: DRIVERS VS RESTRAINTS



Source: Expert Interviews, MarketsandMarkets Analysis

3 MARKET OVERVIEW

3.1 MARKET DYNAMICS

3.1.1 DRIVERS

3.1.1.1 Adoption of 3D Printing in Home Printing

The 3D printing industry has been in the market from the last 30 years, but the sudden hype is due to the availability of 3D home printers. These home printers are available in the market at low costs of about $XX that helped the consumer market grow at a high rate. Currently, these printers are available in homes, offices, computer stores, and shopping hubs, where one can create their own products at low costs and at a considerably short span of time. For example, imagine the need to repair or replace our home appliances where these printers help to print the spare parts in the living room and there is no need to order online. Hence, these printers also cut down the supply chain where we can save on the production and shipping costs.

In general, home printers use plastic materials-especially Acrylonitrile butadiene styrene (ABS) and Polylactic acid (PLA). ABS and PLA are flexible in nature and are available in a wide range of colors. The home printers available in the market use these plastic materials that are available in filament forms with a diameter of either XX mm or XX mm. The costs of these materials vary with the diameter, color, quality, ordered quantity, and also the supplier. In general, the cost of these materials ranges from $XX to $XX per kilo.

Along with the advantage of low costs, the growing technological advancements is what has made the 3D printing simple, since there is no requirement of huge machine tools and one can have a hands-on experience to print objects. Day by day, the adoption of these 3D printed objects grows aggressively with the online service providers such as Shapeways, Ponoko, Sculpteo, i.materialsie, and others that boost the market further to grow at a high rate. Hence, the factors above are what drive the 3D printing materials market with an aggressive adoption of home printers.

3.1.2 RESTRAINT

3.1.2.1 High Material Costs

3D printing is an easier way to manufacture objects, but is expensive due to high material cost that is a big restraint to the market. For example, the Acrylonitrile butadiene styrene (ABS), a commonly used material, costs about $XX per kilo in general applications, where as in the powder or filament form, 3D printing costs at an average $XX a kilo. The high costs are due to higher standards of purity and composition required for 3D printing. The metal materials for 3D printing costs at an average of about $XX to $XX per kilo which is too costly to use in general applications as the final product costs are too high compared to the products available in the market.

However, with the growing demand in several applications and consumption, this is a big challenge for material manufacturers to develop and supply low cost materials. As there are several new entrants in the market, there is heavy competition among manufacturers and suppliers to provide materials at low costs to customers. With new entrants and high investments in R&D activities to develop low cost materials, experts believe that the cost of materials is going to fall in the near future. Hence, with a reduction of costs, the demand and consumption of materials will grow exponentially at a high rate than the expected growth rate.

4 3D PRINTING MATERIALS MARKET, BY TYPE

4.1 PLASTICS

Plastics in 3D printing include Acrylonitrile Butadiene Styrene (ABS), Polylactic Acid (PLA), nylon, photopolymers, polypropylene, polycarbonate, High-Density Polyethylene (HDPE), Polyvinyl Alcohol (PVA), duroplastics, etc. Of the plastics mentioned above, ABS & PLA are the major materials that together accounted for XX% of the 3DP materials and XX% of the plastic materials globally. Plastic materials that are durable and elastic in nature are available in a wide range of colors. Generally in 3D printing, the plastic filaments used are either of XX mm or XX mm in thickness and the choice is based on the type of printer used. With the invention of home 3D printers consumer printing has become a major application where plastics are commonly used. With increasing awareness on 3D printing capabilities where designs are limited to designer imagination, plastic materials create wonders day by day through the launch of new products in the market. Hence, to meet the future demand, plastic material manufacturers invest highly in R&D to launch new materials in the market.

TABLE 2

PLASTIC CONSUMPTION & VALUE, 2011-2018

Particular	2011	2012	2013	2018	CAGR % (2013-2018)
Consumption (Tons)	XX	XX	XX	XX	XX
Value ($Million)	XX	XX	XX	XX	XX

Source: Secondary Research, Primary Research and MarketsandMarkets Analysis

Plastics were estimated to be XX tons in 2012 and are expected to reach XX tons by 2018, with a high CAGR of XX% from 2013 to 2018. In terms of value, the total plastics globally were estimated to be $XX million in 2012 and are expected to reach $XX million by 2018, with a CAGR of XX% from 2013 to 2018. With a rapid reduction in the price of plastic materials, the value is growing a little slower compared to that of consumption.

5 3D PRINTING MATERIALS MARKET, BY FORM

5.1 INTRODUCTION

3D printing materials, from the day of evolution has expanded its range of products through the addition of new materials in the existing list that are being used in the 3D printing of end-user objects. With the growing technology and demand, the availability of materials in different forms from different suppliers is high. As such, the available forms of 3D printing materials can be classified into three types: filament, powder, and liquid. These available forms are not specific to one application and are completely based on customer choice.

5.2 FILAMENT

General plastic materials are available in filament forms in 3D printing processes. The plastic materials that are available in filament forms include: Acrylonitrile Butadiene Styrene (ABS), Polylactic Acid (PLA), nylon, photopolymers, Polyvinyl Alcohol (PVA), PolyCarbonate (PC), High Density Poly Ethelene (HDPE), and other thermoplastics. Among these, ABS and PLA are the major materials in terms of production and demand. The filaments available in the market are either XX mm or XX mm and the selection is based on the printer that is used by customers. Ceramic, glass, and laywood are also available in filament forms for any special application in dental laboratories. In general, the available filaments supplied by printer manufacturers help enhance and enlarge their printer sales and provide services to customers with advanced materials.

Filaments are available in a wide range of colors, where price varies with the color. The range of filaments available in the market lies in the range of $XX to $XX per kilo and the prices are about to drop year on year. The table below summarizes the 3D printing filament consumption and value in the past and in the future market.

TABLE 3

FILAMENTS CONSUMPTION & VALUE, 2011-2018

Particular	2011	2012	2013	2018	CAGR% (2013-2018)
Consumption (Tons)	XX	XX	XX	XX	XX
Value($Million)	XX	XX	XX	XX	XX

Source: Primary Interviews, MarketsandMarkets Analysis

Filaments are generally used in home printers, consumer printing, and in industrial applications that accounted for XX% of total materials consumed in 2012. The total filament consumed in 2012 was XX tons and is expected to grow at a CAGR of XX% from 2013 to 2018 to reach XX tons by 2018. The cost of the filaments dropping day by day is due to high demand and the growing number of suppliers. Hence, the values are estimated to reach $XX million by 2018, at a CAGR of XX%.

6 3D PRINTING MATERIALS MARKET, BY APPLICATION

6.1 INTRODUCTION

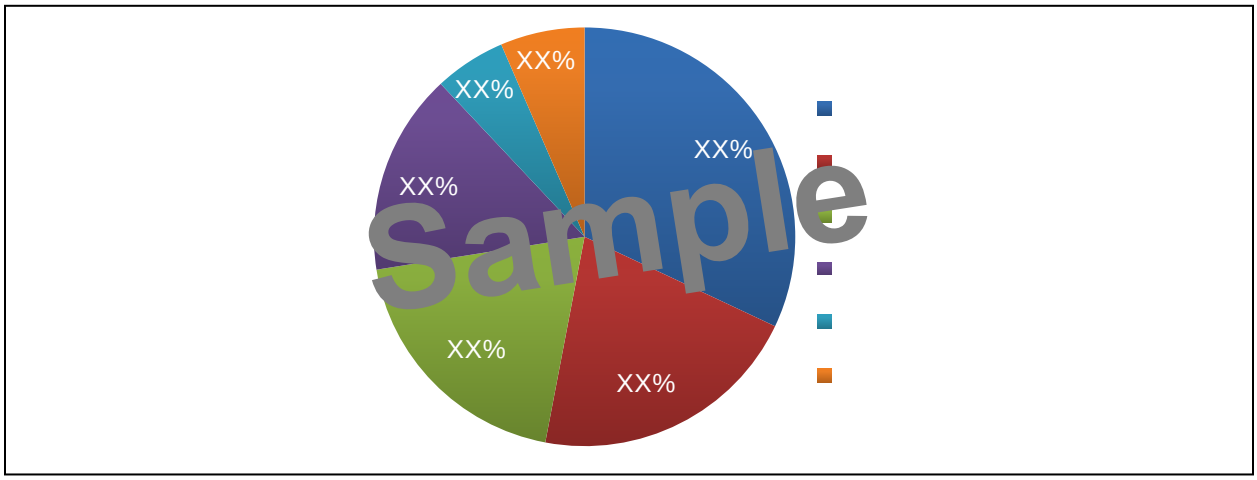
3D printing, the current revolutionary technology globally, is aggressively expanding its footprint in different applications. Currently, nearly everything from aerospace components to toys is built with the help of 3D printers. 3D printing has now been introduced into the fields of automotive, medical, aerospace, defense, dental, bio-medical, jewelry, art, architecture, fashion design, interior design, and several others. Along with these, electronics, robotics, spacecrafts, construction, organ transplantations, food, etc. are the emerging and new entrants that adopt the 3D printing technology. All of these applications use and demand different materials for individual applications. Hence, the consumption consumptions of these materials are expected to grow aggressively with the growing demand. This trend in technology is limited to one's imagination of what one can manufacture and innovate creative products in the market every day.

3D printing has access and the ability to print both simple and complex objects in sizes that range from small to large. For example, 3D printing can print ear bud wrapping cases to aero jet wings, a writing pen to motor cycles, hair driers to human organs, and so on, which is up to the user's imagination and design. Manufacturers produce different grades of 3D printing materials that come with varying characteristics. This production aims to meet the different needs of varying industry applications. 3D printing is a simple process as it requires a reduced amount of the set up equipment. Growing end-user industries will drive the future demand of 3D printing materials.

In this section, the consumption and value of 3D printing materials consumption are analyzed based on major end-user industries such as Consumer & Industrial, Aerospace & Defense, Automotive, Medical & Dental, Education, and Others. The figure below represents the market share for major applications in terms of values in 2012.

FIGURE 3

3DP MATERIALS MARKET SHARE VALUE, BY APPLICATION, 2012



Source: Primary Interviews, Company Reports, News Articles and MarketsandMarkets Analysis

The figure above represents the 3DP materials market share by value in 2012. The consumer & industrial applications that accounted for XX% where as the aerospace & defense and automotive industries together accounted for XX% in 2012. The demand for 3D printing will continue to be high in the aerospace & defense and automotive industry, due to the increasing demand for new products and an ease of manufacturing. In 2012, the medical & dental industry generated XX% of the 3DP material values and the demand for this is expected to grow at a high rate due to mass production and high investments in R&D to print pharmaceuticals, human organs, dental crowns, and medical devices.

The Education industry is another rapidly growing market with investments from all regional governments to bring about awareness in students of the technology, production processes, and material development. Several universities have started participating in the R&D for new materials and have successfully launched new materials in the market. Other industries include bio-medical, jewelry, art, architecture, fashion design, electronics etc., which accounted for XX% of the 3DP material values in 2012 and are expected to expand the market values at a high rate in the near future.

7 3D PRINTING MATERIALS MARKET, BY GEOGRAPHY

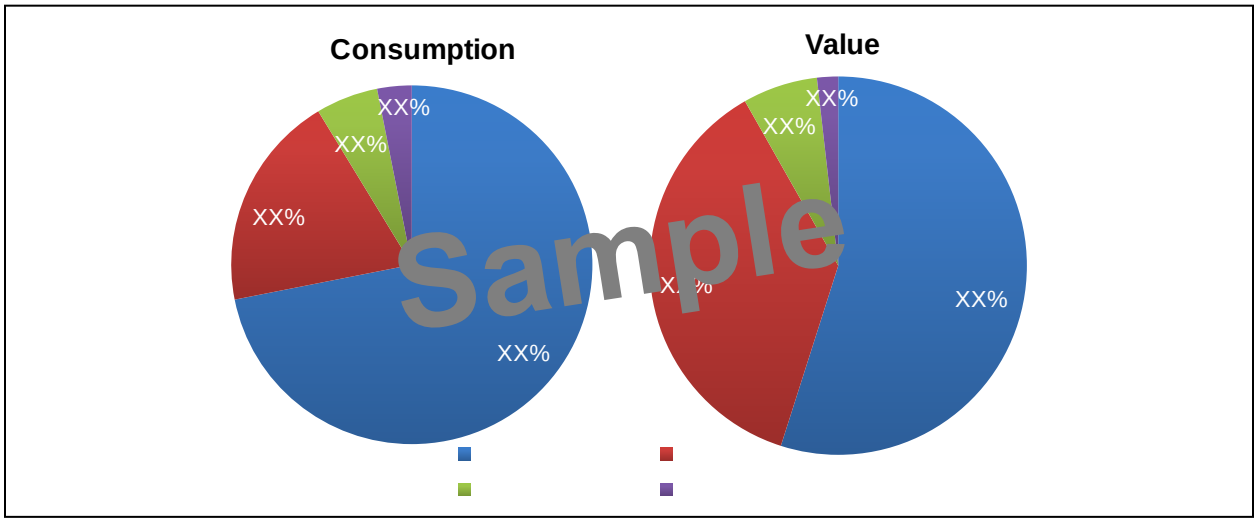
7.1 ASIA-PACIFIC

Asia-Pacific is the second major market for 3DP materials, globally. With the latest announced plans of ARKEMA, EOS, Stratasys and 3D systems with regards to their expansions in Asia-Pacific, the demand in this region is about to meet the aggressive growing market. China, Japan, India, and Singapore are the major countries that are actively participating in 3D printing activities. The cost of raw materials is less in Asia-Pacific, due to the availability and a high potential for 3D printing in the coming future. In Asia-Pacific, there are a few market players, which is why it is impossible to meet the growing demand with the existing players. Hence, the major players from surrounding countries are actively participating in expansion and the construction of new production facilities in Asia-Pacific to gain more profits. Recently, Microsoft announced its partnership with Taiwan-based 'New Kinpo Group' to explore the 3D printing market with its Windows XX mobile operating system, which is a boost to the Asia-Pacific market. The Singapore government has allocated $XX million over the next five years to enhance the capabilities of 3D printing. With this growing demand, Asia-Pacific is expected to dominate the North American market by 2018.

Stratasys Ltd. (U.S.); 3D systems Inc. (U.S.); EOS Gmbh Electro Optical Systems (Germany); and ARKEMA (France) are the global players with a business presence in Asia-Pacific, since they are acquiring small scale and start-up companies in Asia-Pacific to expand the market.

FIGURE 4

ASIA-PACIFIC: 3DP MATERIAL MARKET SHARE, BY TYPE, BY CONSUMPTION & VALUE, 2012



Source: Expert Interviews, Secondary Research, Press Releases and MarketsandMarkets Analysis

The figure above represents the Asia-Pacific market share by type of 3DP materials in terms of consumption and value in 2012. In Asia-Pacific, plastic materials accounted for XX% of the total 3DP materials in terms of consumption and XX% in terms of value in 2012. Consumer printing in Asia-Pacific is in high demand compared to other regions; hence, the plastic consumption is high and cost of plastics has drastically reduced compared to the last year. Metals are the next major materials that accounted for XX% in terms of consumption and XX% in terms of value in 2012. This difference in consumption share and value share can be attributed to high costs of metal materials compared to that of plastics. Ceramics and others are niche markets in Asia-Pacific, which together accounted for XX% in terms of consumption and XX% in terms of value in 2012.

TABLE 4

ASIA-PACIFIC: 3DP PLASTIC MATERIALS MARKET CONSUMPTION, BY TYPE OF PLASTIC, 2011-2018 (TONS)

Material type	2011	2012	2013	2018	CAGR % (2013-2018)
ABS	XX	XX	XX	XX	XX
PLA	XX	XX	XX	XX	XX
Photopolymers	XX	XX	XX	XX	XX
Nylon	XX	XX	XX	XX	XX
Others	XX	XX	XX	XX	XX
Total	XX	XX	XX	XX	XX

Source: Secondary Research, Expert Interviews and MarketsandMarkets Analysis

In terms of consumption, the total plastic material in Asia-Pacific was XX tons in 2012 and is expected to reach XX tons by 2018 at a CAGR of XX% from 2013 to 2018. PLA in Asia-Pacific was XX tons in 2012 and with the growing demand in consumer 3D printing it is expected to reach XX tons by 2018 at a CAGR of XX% from 2013 to 2018. ABS is the next major plastic, which is expected to reach XX tons by 2018 at a CAGR of XX%.

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