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Joint News Release

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BASF Ultrafuse 316L – Metal filament for industrial 3D printing

- **Simple and cost-effective printing of stainless steel metal parts**
- **Reduces dramatically the potential hazard of handling fine metallic powders when compared to SLM or Binder Jetting**
- **Specially designed for open FFF 3D printers**
- **BASF begins the commercialization of Ultrafuse 316L with iGo3D, Ultimaker, and MatterHackers**

With Ultrafuse 316L, BASF 3D Printing Solutions launches an innovative metal-polymer composite for Fused Filament Fabrication (FFF) into the market. It enables the safe, simple, and cost-efficient production of fully metal parts for prototypes, metal tooling, and functional metal parts in the simplest 3D printing process. After the subsequent industry-standard debinding and sintering, the final 3D printed part is 316L stainless steel.

FFF refers to a 3D printing process in which parts are built-up layer-by-layer from moldable material, originally limited to thermoplastics. Ultrafuse 316L, a metal filament with polymer content, uses the same process; first, a suitable 3D printer builds a part layer-by-layer, with the polymer content of the filament acting as a binder. The main polymer content (primary binder) from the so-called green part is removed in a catalytic debinding process. The result of this process is the brown part, which consists of pure metal particles and a residual binder (secondary binder). The subsequent sintering process at temperatures right below the melting temperature of the metal removes the secondary binder from the brown part and causes the metal

particles to coalesce. The material reaches its final properties post-sintering, for example with regard to hardness and strength.

The metal content in the high 90 percent range and the even distribution of the metal within the binder matrix reduces the risk of defects and increases the success rate. Due to immobilization of metal particles in the binder matrix into a filament dramatically reduces the potential hazards of handling fine metal powders when compared to Selective Laser Melting (SLM), Direct Metal Laser Sintering (DMLS), Direct Metal Deposition (DMD), and Binder Jetting.

The new metal composite filament is highly flexible and strong: Ultrafuse 316L can be used with both Bowden and direct drive extruders and can be guided through complex filament transport systems. "Ultrafuse 316L can, under certain conditions, be processed on any conventional, open-material FFF printer," explains François Minec, Managing Director, BASF 3D Printing Solutions. "Our goal was to develop a high-quality metal filament that makes the additive manufacturing of metal parts considerably easier, cheaper, faster, and accessible to everyone."

"In comparison to Metal Injection Molding (MIM), the Ultrafuse 316L offers an office-friendly solution, which opens new production opportunities," says Athanassios Kotrotsios, Managing Director, iGo3D. "To reach the full potential of the metal filament and to ensure a solid start, it is necessary to understand that Ultrafuse 316L is not a conventional filament," explains Kotrotsios. "Our goal is it to provide full service packages and support from the first request up to the finalized and sintered part, to implement metal 3D printing as a natural component in your manufacturing process."

"The Ultimaker S5 raises the bar for professional 3D printing by offering a hassle free 3D printing experience with industrial-grade materials. We are proud to announce that print profiles for Ultrafuse 316L will be added to the Ultimaker Marketplace", says Paul Heiden, Senior Vice President Product Management, Ultimaker. "3D printing professionals worldwide can then use FFF technology to produce functional metal parts at significantly reduced time and costs compared to traditional methods."

"Ultrafuse 316L from BASF enables engineers and designers to produce true, pure, industrial grade metal parts easily and affordably using desktop 3D printers," says Dave Gaylord, Head of Products, MatterHackers. "This material is a significant technological advancement and truly a shift in how we describe what is possible with desktop 3D printers."

For more information on BASF's metal filament Ultrafuse 316L, visit our website:

www.basf-3dps.com

About BASF 3D Printing Solutions

BASF 3D Printing Solutions GmbH, headquartered in Heidelberg, Germany, is a fully owned subsidiary of BASF New Business GmbH. It focuses on establishing and expanding the business with 3D printing materials, system solutions, components and services. BASF 3DPS is organized into startup-like structures to serve customers in the dynamic 3D printing market. It cooperates closely with the global research platforms and application technologies of various departments at BASF as well as with leading research institutes, universities, startups and industrial partners. Potential customers are primarily companies that intend to use 3D printing for industrial manufacturing; typical industries include automotive, aerospace and consumer goods.

For further information please visit: www.basf-3dps.com.

About BASF

At BASF we create chemistry for a sustainable future. We combine economic success with environmental protection and social responsibility. The approximately 122,000 employees in the BASF Group work on contributing to the success of our customers in nearly all sectors and almost every country in the world. Our portfolio is organized into six segments: Chemicals, Materials, Industrial Solutions, Surface Technologies, Nutrition & Care and Agricultural Solutions. BASF generated sales of around €63 billion in 2018. BASF shares are traded on the Frankfurt Stock Exchange (BAS) and as American Depositary Receipts (BASFY) in the U.S. For further information please visit:

www.basf.com.

About iGo3D

iGo3D is a pioneer in the field of professional desktop 3D printing solutions in the DACH region. The extensive sales and services network is offering sector-specific solutions for industry, automobile and aviation industry, dentistry and education among others. With its own logistics center, a certified service facility for repairs and a proven marketing concept, iGo3D supplies its customers with 3D printing products from the most renowned manufacturers. Since the foundation in 2013, the company has grown steadily and now has 40 employees at its headquarter in Hanover. www.igo3d.com/

About Ultimaker

Since 2011, Ultimaker has built an open and easy to use solution of 3D printers, software, and materials that enable professional designers and engineers to innovate every day. Today, Ultimaker is the market leader in desktop 3D printing. From offices in the Netherlands, New York, Boston, and Singapore - plus production facilities in Europe and the US - its global team of over 400 employees work together to accelerate the world's transition to digital distribution and local manufacturing. www.ultimaker.com

About MatterHackers

MatterHackers is one of the largest 3D printing retailers in the world. Their Orange County showroom is home to 70+ 3D printer models and 1000+ materials. MatterHackers' mission is to make 3D printing and digital fabrication easier and more accessible for everyone by providing unbiased guidance and recommendations to help schools, businesses, and individuals get started (or stay current) with 3D printing. MatterHackers provides free phone and email support for everything we sell, and US shipping is always free. For further information please visit: www.matterhackers.com

Contacts:

BASF SE

Media Relations
Katharina Molko
Phone: +49 174 3480161
<mailto:katharina.molko@basf-3dps.com>

iGo3D GmbH

PR/Social Media
André Meißner
Phone: +49 511 898887 - 281
<mailto:andre.meissner@igo3d.com>

Ultimaker BV

Media Relations
Moniek Jansink
Phone: +31 615386237
<mailto:m.jansink@ultimaker.com>

MatterHackers, Inc.

Head of Products
Dave Gaylord
Phone: +1 (949) 613-5838
<mailto:dave.gaylord@matterhackers.com>