taulman3D Materials: **1/16/2015**

Company Goals:

taulman3D (pronounced ""tallman" 3D") is a polymer and copolymer development and manufacture of 3D Printing materials for FFF 3D Printers since Oct 2012. As components, parts, gadgets and assemblies continue to decrease in size, the need for higher strength materials that can meet the demands of designers as well as stand up to the abuse of the real world, continues to grow. Watching the progress of FFF 3D Printing, we saw a need to increase the number of options for designers, engineers and artist in the materials selection process. At taulman3D, we develop and test hundreds of possible polymers and copolymers in an effort to bring a specific feature list to the 3D Printing community. When we believe we have a significant development, rather than just release and let the community determine acceptance, we send out hundreds of free samples to professionals worldwide and correlate comments and requested changes. Therefore if the testers believe a material is not mature, we pull it and go back to the chemistry. To date, we have completely pulled two polymers and made changes based on community suggestions to 3 others as we believe this is best for the community and the technology. All taulman3D 3mm dia filaments are actually mfg at the new standard of 2.85mm.

taulman3D Materials

Nylon 645: The #1 high strength 3D Printing material of Choice used by 100's of Industrial customers worldwide.

645 was a result of the feedback from the industrial community that had started using nylon 618 as 618 was released about 6 months earlier. The industrial community made requests for a higher strength nylon, as well as a polymer that was easier to evaluate in the final part/print. taulman3D worked with the community to develop nylon 645. Nylon 645 is a nylon 6/9, or a variant of nylon 6 and nylon 6T with a crystallinity optimization process. This provides a high degree of transparency. The transparency allows the industrial quality control groups to evaluate printed parts without destructive evaluation. Quality inspectors can easily look through the perimeters and make a determination as to the adhesion of inner fills. Today, Nylon 645 is the established industry standard for high strength, high durability 3D Printing. Over 60 corporations and manufacturing companies use Nylon 645 for their most demanding designs and needs. Nylon 645 comes on 1 lb and 20 lb spools.

645 is a 65% transparent white color. It has a higher strength than 618 and is about 20% less pliable. 645 will dye with acid based dyes. Even though the polymer is less pliable, it maintains the slippery surface feature of nylons. Also as a nylon 6T variant, clumping is almost non-existent. 645 is a preferred polymer when parts to be printed will be subject to high stresses. As an extremely durable polymer, it handles stress at elevated temperatures. Depending on use, as high as 160C. 645 has the same chemical resistance as 618, but has 20% more resistance to chlorines.

Nylon 618s:

618s is fully processed taulman 618 nylon co-polymer in a 30 mesh powder designed for sintering polymer 3D Printers. This includes the final processes developed by taulman3D. 618s is medium to light grey to reduce unwanted reflections and to increase thermal absorption. 618s comes in sealed and vacuum packed wrappers of approximately 1 pound. Currently only a limited amount is available for those developing a new sintering printer.

Nylon 618:

618 was the first nylon specifically formulated and processed for 3D Printing. Technically, nylon 618 is an extremely high quality variety of nylon 6,6. Only one chemical company manufactures this specific variation of nylon. Both the chemical composition and post processing developed by taulman3D work together to lower the print temperature of high quality nylon as well as reduce the non-uniformity that nylons exhibit in the melted state.

618 is a pure white polymer and fully capable of absorbing acid based dyes. 618 printed with 100% fill rivals it's injection molded equivalents in strength. All of the feature of nylon that we come to depend on are at the maximum in 618. Slippery surfaces, pliability, strength, non-scrape, chemical resistance and high thermal durability.

Nylon 230:

Nylon 230 is the fist nylon ever developed to be printed at 230C or a lower temperature than any other 3D Printing Nylon. With the release of Nylon 230 (summer 2015), taulman3D will provide owners of PLA only or PLA and ABS only 3D Printers to add high strength Nylon to their list of material choices. In addition, Nylon 230 prints on Blue tape, and even better on "built-tak" type surfaces as well as print bed treated with various PVA glues/glue sticks.

"Bridge" Nylon:

Bridge (645 revB) as noted is a variation of 645. As a result of 3D printer's requests, taulman3D worked with our chemical group/Company to make changes in the cooled surface of the polymer. This was a major effort to increase the ability to print on non-garolite surfaces. While the shrinking factor for all nylons is slightly higher than ABS, the ability to adhere to a PVA (white glue) in such a way as to overcome the amount of total shrinkage, increases the success of parts printed in nylon. Bridge is used for any parts that require the strength of nylon, yet are large and prone to pulling away from the print bed at sharp transitions. Bridge carries the same flexibility as 645 and a slippery surface texture on all perimeters. Bridge was also defined as a high qty run polymer, thus reducing end cost.

Nylon 680 FDA

680 is a very high grade nylon made with an FDA approved polymer specifically developed to meet FDA 21 CFR 177.1500 regarding indirect food contact, except for foods with over 8% Alcohol. 680 was designed to print in the same temperature range as other taulman nylons. 680 is more transparent than nylon 645. Again, this is to support non-destructive visual inspection of the printed part. 680 comes with 2 QR codes. One is for technical information needed by 3D Printers. The 2nd is for traceability. 680 is a non-leaching FDA nylon that's capable of low temperature sterilization techniques. Specifically, Ethylene oxide and high temperature sterilization as in Flash Steam post processing. 680 is less pliable than nylon 645 as it is intended to support a long list of medical uses. 680 completed community testing in 2014.
NOTE: Nylon 680, will be a controlled material as to date code, batch code and processing codes. Available to everyone, each user will be automatically assigned a "User ID". This allows each spool to be traced back to taulman3D for verification. Unlike our other products, 680 will be labeled on both spool flanges and no additional labels are allowed. Nylon 680 comes vacuum packed and boxed. Nylon 680 will be available in March 2015.

Alloy 910

910 is the first 3D Printable High Impact, High Durability co-polymer Alloy with a tensile strength of 8,100PSI, thus matching 10-15%% glass filled materials! Alloy 910 is meant for high temperature high strength high durability uses. Alloy 910 is an excellent material for molding , Robotics, Machining or any need that requires a High Tensile feature along with high durability. Due to Alloy 910's chemical composition, it has the least water absorption of all similar materials containing a Nylon component. Alloy 910 completed industrial testing in 2014. Alloy 910 will be available in Apr/May 2015.

t-glase (PETT) - (Pronounced "T Glass")

t-glase is a high quality Polyethylene terephthalate polymer. It is modified to provide a 5% higher amount of reflectivity making it more equivalent to a glass polymer. t-glase is also processed using the same techniques taulman3D developed for nylon. Full processing allows for a polymer that easily prints at 235C - 240C. A temperature easily obtained by most FFF 3D Printers.

t-glase is also a high strength polymer meant for industrial applications. The major advantage of t-glase to all other polymers, is layer to layer bonding. Because the polymer bonds so well, there is no need to smash a large number of thin layers together to accommodate a good bond. Industry uses layer settings that are 50% to 80% of the nozzle dia with excellent results. t-glase has a very low shrinkage factor and is best printed on glass print beds heated from 60C to 80C depending on part size. t-glase also prints easily on glass heated to 45C and using a thin coat of PVA (Elmers Glue All)
As with nylon 645, 680 and 910, the clarity of t-glase supports industrial non-destructive evaluations. In addition, t-glase is a directly printable polymer for glass clear jewelry.

Users should watch the blogs for new 3D Printing jewelry designers to start advertising. And due to the additional reflectivity, t-glase is considered the only high transmission light-pipe polymer. Due to it's chemical make-up, light transitions easily along the path of a printed thread. This allows the designer to draw and print a light-pipe with any path required.
t-glase comes in the following colors:
Clear
White - new
Blue
Red
Black
Green

PCTPE:

PCTPE is a newly developed highly flexible 3D Printing material. PCTPE stands for "Plasticized Copolyamide TPE" or a chemical co-polymer of highly flexible nylon and TPE (thermoplastic elastomer) . PCTPE has several unique features that allow any user to print a highly flexible part with the added durability of our nylon polymers. This combination of polymers was developed specifically to allow anyone using current FFF 3D Printers to print parts from durable prosthetics to complete cosplay wearable outfits, cell phone enclosures as well as highly flexible utility/industrial parts. The flexibility of PCTPE means that the end parts will have the smooth lustrous texture of nylon, the added flexibility offered by a rubber like TPE, yet maintain the high durability and non-delaminating benefits of all taulman3D Printing materials.

Like all taulman3D Nylon materials, PCTPE takes on acid based dyes for any color desired. It's stock color is a bright gloss white.

A major feature of PCTPE is that even at 1.75mm and with it's high flexibility, it will not fold, bend or dislodge in the extrusion path of 3D Printers, a common issue with other flexible materials. PCTPE prints at ~ 235C on a heated glass bed set to 45C with a layer of PVA.

PLAdium PLA:

PLAdium PLA is taulman3D's new high strength PLA. taulman3D to develop a 3D Printed PLA that meets the bonding and strength requirements of all taulman3D materials. We found newer PLAs developed as a replacement for PETG in packaging "blister packs". This material was developed originally as a replacement for PETG and fully meets the strength requirement, and just as important, it is a non-yellowing PLA. PLAdium prints at 210C-230C and follows all other PLA Printing methods. The initial release is Feb with the first shipments in clear. Then colors to soon follow. Unlike other taulman3D materials, we are releasing PLAdium on 1kg spools. PLAdium is an engineering PLA in that with the additional size sensors and non-yellowing clear material, both high strength as well as non-destructive evaluation are available to the end user/design house.

BluPrint:

BluPrint has a Tg of 110C+ but with a print temp of only 265C. Prints cold or warm (45C) BuilTak and on clean glass heated to ~92C. BluPrint is a semi-clear material of ~ 84% transmission. Like all taulman3D materials, BluPrint is a 100% bonding layer to layer polymer when printed at defined temperatures. A significant advantage of BluPrint is that when paired with the new E3D Volcano hotend, users and industry can print at speeds of 44mm/s with a 1mm nozzle and .46mm layer. As layer and nozzle size go down, speeds increase as expected to 120mm/s with a .4mm nozzle. BluPrint will allow designers to 3D Print parts that will take high heat for outdoor use such as part replacements for Autos, Boats and Aircraft.

Development:

At taulman3D, we have 8-12 materials in development at any one time. The intent of these efforts is to make more material features available to the Engineer, Designer and Artist. In the area of utility, we see the next major usage of FFF 3D Printing in the Robotics field. In art and esthetics, we see rising needs for larger scale artistic items that capture and re-utilize light in way's to capture attention and inspire imagination. In the medical industry, we see the continuing development and transition to real patient use of all type of prosthetics that can handle the loads and stresses of humans as well as animal requirements. In high performance/smaller assemblies, we see a rising need for new alloys.