Futation

We bring materials, technologies and ideas

Erik Haastrup Müller

+45 21691339

em@futation.com

www.futation.com

www.materialsampleshop.com

Injection Mouldable Wood

Wood that can be moulded like synthetic thermoplastics.

What? This injection mouldable material is made exclusively from renewable resources. It consists primarily of lignin, an organic polymer that is a byproduct from papermaking. It can be formed into mouldings, sections, or panels on conventional plastics processing machines.

Used for? Applications include the backing of wood veneer, musical instruments, golf tees, knife handles, heels for shoes, and furniture components.

Details? It is possible to adjust strength, rigidity, and other material properties by changing the composition. The tensile strength is between 10 and 22 MPa and the tensile modulus is between 4000 and 6000 MPa. It is available in a variety of colours. It can be disposed of in the same way as naturally grown wood, i.e. by decay or incineration. The amount of CO^2 emitted in the process is no more than was naturally fixed from the atmosphere by the plants while growing.

Vendor? www.tecnaro.de - Product name is Arboform®

Price? ~€4 per kg.

Idea? Use injection mouldable wood to create single-use gardening products.

Try it? -

Micro Colour Code Particles

System for legally binding counterfeit protection.

What? These micro colour particles are made with a sequence of coloured layers that can be read under a microscope. The particles are produced with a unique colour code for each user or application; they therefore function as a "fingerprint" that unambiguously identifies the authenticity of any object on which the particle is found. The smallest particles measure just 8 micrometers across and are therefore invisible to the naked eye.

Used for? The particles are applied on products, packaging, or documents where the absence of particles will indicate counterfeiting. The particles also allow for production and supply chain traceability.

Details? A range of application methods allows the particles to be applied on most materials. The particles can have from four to ten coloured layers, which allows for the production of 4.35 billion unique codes.

Vendor? www.secutag.com - Product name is SECUTAG®.

Price? Applied by silkscreen printing, the particles can be employed for only a fraction of a cent per unit.

Idea? Use the particles for covert marking of valuable objects, where they will prove the ownership in case of theft.

Try it? The particles are found in the round white spot.

Reusable Mould Material

Lowers the cost of moulds for casting.

What? This rubberlike material turns into a low-viscosity liquid when heated above its melting point of 55°C. It is non-toxic and biodegradable.

Used for? It is used as a pourable mould material to make moulds for casting polyurethane, epoxy, concrete, soap, chocolate, and other materials. It is often used instead of thermosetting silicone, which is a single-use material. The reusable mould material can dramatically lower the cost of experiments and small-quantity moulding.

Details? It can be heated in a microwave. The material can be re-melted to form new moulds up to 35 times. There are variants of the material with different hardnesses and a variant that is safe for food contact. The manufacturer does not disclose what the material is made from, but it is probably based on gelatin and glycerin.

Vendor? www.composimoldstore.com

Price? €30 per kg.

Idea? Use the material to reduce the cost of moulding parts for customised prostheses.

Try it? You can melt the sample in the microwave.

Polycaprolactone (PCL)

A polymer with a very low melting point.

What? This polymer has a melting point of only 60°C, which means it can be shaped by hand after a few minutes in hot water. PCL can be reheated and reshaped again and again. It feels like nylon when hardened.

Used for? Polycaprolactone (PCL) is originally an industrial polymer with applications in, for example, hot-melt glue and laminating pouches. It is also used for model making and prototyping. It can be used to make moulds for reproduction. It is also used for jewelry making under the brand name Friendly Plastic.

Details? PCL is non-hazardous and biodegradable; it can be coloured with fruit colours. Typical modulus of elasticity is ~440 MPa and tensile strength is ~16 MPa. PCL is resistant to water, oil, solvent, and chlorine.

Vendor? www.perstorp.com - product name CAPA 6800. It is available to consumers under the brand names Shapelock (US), Polymorph (UK), and Friendly Plastic.

Price? ~€14/kg when purchased in a quantity of 100 kg. You can buy smaller quantities from www.materialsampleshop.com

Idea? Any product for end user customisation.

Try it? Put it in boiling water and shape it by hand.

Silicone Clay

Never dries out and can be permanently set by heating.

What? This non-toxic and odourless clay is made from silicone. It does not dry out like many other clays and therefore has a long lifespan. It is possible to permanently set the shape of the clay by heating it in an oven at 200°C for 10 minutes. After heating the clay has properties similar to silicone rubber.

Used for? It is sold as a modelling clay that children can use to make toys and figures.

Details? The clay is available in various colours. It is possible to combine different colours and separate them again if the colours have not been mixed thoroughly. The clay is certified to use as a children's toy. It has antibacterial properties and the heat-set clay can be cleaned in a dishwasher.

Vendor? It is manufactured by www.isilicone.com and sold in Denmark by www.silly-doh.dk

Price? The retail price is €73 per kg.

Idea? Make personalised earplugs or cutlery grips for handicapped or elderly people.

Try it? One of the samples has been set by heating and the other is the raw clay.

Taggant Marking

Enables traceability of individual moulded products.

What? Small fluorescent particles embedded within plastic pellets (aka a masterbatch) are added to plastic raw materials before moulding. During the moulding process the particles are completely randomly distributed within the moulded part. The unique pattern of particles on a small area of the surface of the individual part is read with special light-emitting reader and then saved digitally. The pattern serves as a unique fingerprint, allowing for the identification of individual moulded parts at a later time.

Used for? The ability to identify and thereby trace individual parts can be used in all stages of the product life cycle. Applications include the identification of counterfeits, quality management, and supply chain monitoring.

Details? The particle size is less than 10 µm and the particles do not change the colour or appearance of the plastic. The marking pattern can be identified with a handheld reader or by automated inline sensors.

Vendor? www.gabriel-chemie.com – the product name is TagTec.

Price? -

Idea? Use it to trace individual plastic parts in medical devices.

Try it? The particles are visible only under a microscope in light with specific wavelengths.

Water Soluble Polymer Film

The film dissolves in either hot or cold water.

What? This film is made of Polyvinyl Alcohol (PVA or PVOH). It dissolves fast when it comes into contact with water. It is biodegradable and non-toxic (not approved for food).

Used for? The film variant of PVA is used mainly for dissolvable packaging. It is heat sealable and is therefore convenient for packaging products in dissolvable bags. It is used for sanitary laundry bags that dissolve in the washing machine. It is also used for fishing bait, where a PVA-bag filled with bait is put on the hook. When the bag lands on the river bottom it breaks down, leaving the hook surrounded by bait. One company developed a "revenge bikini set" that dissolves when the user goes swimming.

Details? The film is available in many grades. Dissolution times, dissolution temperature, strength, stiffness, and cosmetics can be modified. It is sold as film, but semi-finished products such as bags are also available.

Vendor? One manufacturer is www.solublon.com

Price? ~15-17 €/kg

Idea? Use it to package an accurate dosage of material to be mixed with water.

Try it? Cut a piece off the sample and put it in water to see it dissolve. It dissolves faster in hot water.

Cellulose Fibre Filled Plastic

Eco-friendly plastic with a smooth and warm feel.

What? Virgin polypropylene is filled with 20 to 50 percent natural cellulose fibre. The material offers a warm and silky-smooth feel, with a strength and stiffness well beyond that of most common thermoplastics. The carbon footprint is between 30 and 60 percent lower than that of standard plastics.

Used for? It is used for furniture, casings for electronics, kitchenware, and kitchen tools.

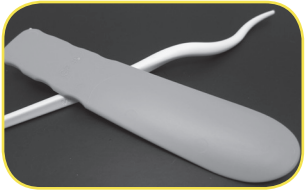
Details? The plastic is odourless and has a good colourability, and the fibre content does not adversely affect the look and feel of the surface – which is often the case with other wood fibre filled plastics. The mechanical properties are dependent on the fibre content selected, but the Young's modulus is 2100 to 5600 MPa and the tensile strength 33 to 53 MPa. The cellulose fibre is sourced from sustainably managed forests and the plastic is recyclable within the normal polypropylene recycling system.

Vendor? www.upm.com - product family is "UPM Formi".

Price? The price is higher than for virgin polypropylene, but lower than higher-end engineering plastics.

Idea? Use it for a low-impact computer mouse that is pleasant to touch without the need for a soft-touch coating.

Try it? Feel the smooth surface on the sample.



PLA Foam

Biobased foam with properties similar to EPS.

What? This lightweight foam is made from expanded Poly-Lactid Acid (PLA) polymer, which is derived from renewable sources such as starch or sugar. The foam's properties are similar to that of expanded polystyrene (EPS aka Styrofoam®), including excellent heat insulation and impact resistance. The foam can be processed using standard EPS shape-moulding equipment.

Used for? The foam is used as a substitute for expanded polystyrene for packaging to reduce the carbon footprint. The unbonded PLA beads are used for cavity-fill insulation and as fill in beanbag furniture.

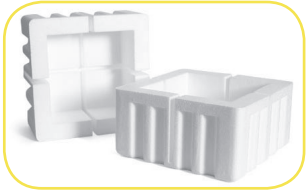
Details? The foam is Cradle-to-Cradle certified, and unlike EPS foam, can be composted under industrial composting conditions. It can also be chemically recycled to obtain feedstock for new PLA polymer. The foam can be expanded to densities between 20 and 100 kg per m^3 using CO^2 as the blowing agent.

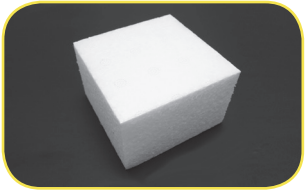
Vendor? www.biofoam.nl - Product name is BioFoam®.

Price? It costs around twice as much as EPS.

Idea? Use it for protective packaging for sustainable consumer products.

Try it? Notice how it is similar to EPS in look and feel.





3D-Printed Optics

Produces transparent and smooth optical elements.

What? This 3D printing technology allows for the production of transparent, matte, textured, or coloured plastic elements with complex geometries and small features. The printing process utilises inkjet technology to build structures from thin layers of a UV-curable photopolymer; they are deposited in a 2D geometry and then cured by UV light. The process allows for on-demand manufacturing of optical elements directly from a CAD model, with no need for expensive moulds or tooling.

Used for? It is used by lighting developers and optical systems designers for prototyping, custom projects, and low- to medium-volume manufacturing. Manufactured elements include Fresnel lenses, free-form lenses, and prisms.

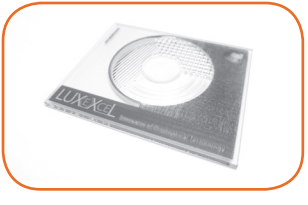
Details? The printing is done with modified wide-format industrial inkjet printers, which can produce geometries measuring up to 1,4 m x 5 m. The desired surface finish is achieved directly from the printer, so there is no need for time-consuming post-processing.

Vendor? www.luxexcel.com - It is called “Printoptical Technology”.

Price? Depends on geometry and order volume.

Idea? Create a spotlight with multiple interchangeable lenses.

Try it? The sample with all features is printed in one operation.



Fresnel Lens Film

Thin film creates the illusion of depth and movement.

What? This eye-catching 3D effect is achieved with a microstructured fresnel lens. The lens structure is embossed into the surface of a very thin transparent PET polymer film. The PET film is typically metallised and laminated onto paper or board where it adds a unique illusion of depth and movement. The lens effect can be combined with printed graphics to make logos and product art stand out.

Used for? The lenses are used on attention-grabbing packaging for liquors, champagnes, fragrances, cosmetics, and DVD media. Packaging integrating the lens effect has been shown to significantly increase sales.

Details? The embossing into the PET film is done with microstructured rollers in a continuous high-throughput process.

Vendor? www.wft.bz offers a broad range of optical-effect films. www.apigroup.com laminates and prints paper and board.

Price? -

Idea? Add the visual effect to bags, clothing accessories, and jewellery.

Try it? Hold the samples and try to move them sideways to experience the 3D effect. The samples show only a small range of the available effects.

Diffractive Optical Element (DOE)

Redistributes light to create tailored patterns.

What? This optical component has a microstructured surface that diffracts light into a tailored pattern. The light is redistributed with very little loss.

Used for? Diffractive optical elements are used for beam shapers, beam splitters, line generators, and diffusers. These components are used in machine vision systems, 3D sensors, bar code scanners, and measurement solutions. The Microsoft Kinect controller uses a projected dot pattern of infrared light generated with a DOE.

Details? Standard elements are available for many applications, but the microstructure – and thereby the light pattern – can be tailored to create virtually any pattern desired. The sample is made from plastic, but you can get glass elements for high-energy applications such as laser cutting and drilling. DOEs are used mostly with laser light, but partially coherent light from LEDs or other light sources can also be manipulated.

Vendor? www.cda-microworld.com

Price? -

Idea? Use DOEs attached to a small laser hanging from the ceiling to project different board game layouts onto a

Try it? Use a laser pointer to see different patterns.

Ejector Pin Microstructures

Add tiny structures in plastic at a very low cost.

What? The surface of the tip of an ejector pin in a standard plastic injection mould is engraved with a microstucture. The structure is embossed in the surface of the plastic part when it is ejected from the mould. The embossed structure can be a micro-text, image, hologram, or a diffractive pattern.

Used for? The technology is used to make covert watermark features for authentication of moulded plastic parts.

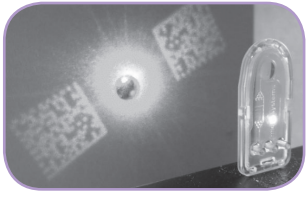
Details? The microstructured ejector pin can be added to existing moulds and the structure has been proven to last for over a million injection moulding shots. Transparent plastics can be embossed with diffraction patterns (see SU48), which can be seen by projecting a laser beam through the plastic. The same effect is also possible by reflection from the surface of non-transparent plastics.

Vendor? www.nano4u.net

Price? -

Idea? Use it to add a unique identification feature at a very low cost.

Try it? Project a laser through the "O" in the logo on the sample to see a diffractive 2D barcode. The ejector mark on the sample has a diameter of just 0.8 mm.



Light-Shaping Surface

The surface geometry redirects light to create images.

What? Proprietary software is used to calculate and design a surface geometry that will redirect passing light in a way that produces a clear and highly detailed light image on a nearby surface. The light effect is known as "caustics" and you have probably experienced it as patterns on the table when sunlight passes through a wineglass.

Used for? The surface geometry is replicated on exclusive watches, jewellery, beverage bottles, and perfume flacons which projects logos and images. It can also be used as an anti-counterfeiting measure that is difficult to replicate.

Details? The technology works with any direct light source such as sunlight or light from a flashlight. The surface geometry is shallow and therefore difficult to see or feel. It works with all transparent materials and it is also possible to design surface geometries for reflective materials.

Vendor? www.rayform.ch – the company designs custom surfaces for clients. The technology is patented and available under license.

Price? -

Idea? Create a children's book with projectable images.

Try it? Use the flashlight on your mobile phone to project the image on the sample onto a surface.

Futation

We bring materials, technologies and ideas

Erik Haastrup Müller

+45 21691339

em@futation.com

www.futation.com

www.materialsampleshop.com