

Ultrason® for household and catering

Stylish, durable and safe



 **BASF**

We create chemistry

ULTRASON®



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THE MATERIAL

Ultrason® for household and catering

Kitchens have become design objects – and they are often the most-used room in the house. When people are not at home, they want to enjoy mealtimes with equally professional and pleasant equipment.

So the demands on household appliances and catering gear are manifold and uncompromising at the same time: They have to be stylish as well as durable, they should be easy as well as safe in usage and they have to comply to legal regulations.

Materials to be employed in this kind of applications have to fulfill several requirements at once: high mechanical stability, excellent long-term service temperature resistance in hot or cold environments, sustained resistance to foods and chemicals as well as approval for food contact. With its Ultrason® portfolio, BASF offers the ideal material for stylish, durable and safe applications in the food and household sectors.

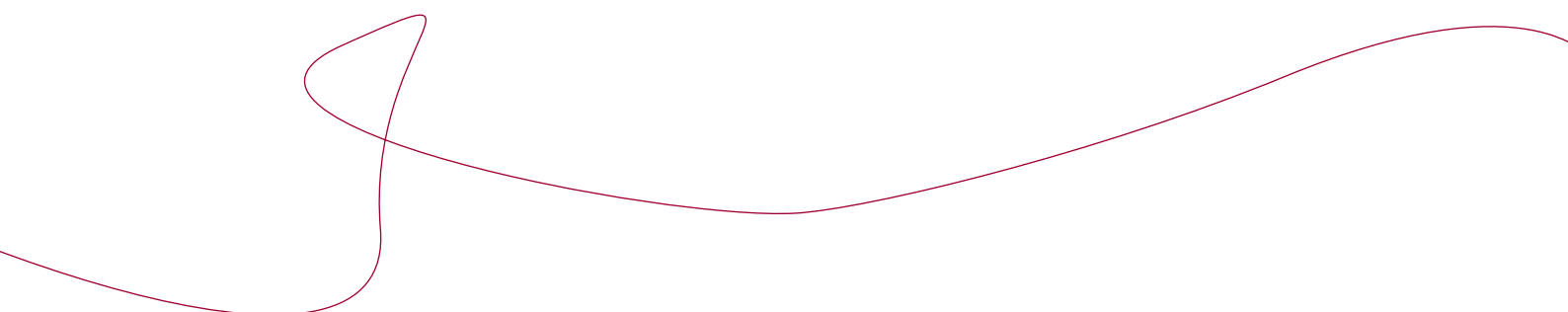
Ultrason® is the trade name for BASF's product range of polyethersulfone (Ultrason® E), polysulfone (Ultrason® S), and polyphenylsulfone (Ultrason® P). It includes reinforced and

unreinforced products for injection molding and extrusion, as well as flake products for solution processing. Ultrason® E, Ultrason® S and Ultrason® P are transparent, high-temperature resistant engineering plastics. Ultrason® P can also be used for applications at extremely low temperatures (-60 °C), e.g. refrigerator drawers. Because of their unique property profile all Ultrason® grades offer great design freedom, can easily be self-colored with masterbatches and can substitute glass, metal, ceramic and porcelain.



Product	Description
Ultrason® E 2010	Standard injection-molding grade of medium viscosity
Ultrason® E 2010 MR	Injection-molding grade of medium viscosity with improved demolding behavior for complex parts
Ultrason® E 3010	Higher viscosity injection-molding and extrusion grade with improved toughness and chemical resistance (stress crack resistance)
Ultrason® E 3010 MR	Higher viscosity injection-molding grade with improved toughness and chemical resistance, improved demolding behavior for complex parts
Ultrason® P 2010	Low viscosity injection-molding and extrusion grade with superior toughness and chemical resistance, resistant against superheated steam
Ultrason® P 3010	Medium viscosity injection-molding and extrusion grade with superior toughness and chemical resistance (stress crack resistance), resistance against superheated steam

Figure 1: Core Ultrason® grades for household and catering applications



ULTRASON® KEY FEATU

- Temperature-independent properties
- Very high, long-term service temperatures
- Temperature resistance up to 180 °C (short-term up to 220 °C)
- Good dimensional stability
- High stiffness
- High mechanical strength
- Excellent hydrolysis resistance
- Resistance to superheated steam
- Stain resistant: no discoloration
- Break resistant
- Very good toughness and impact resistance
- Exceptional chemical resistance
- Available in transparent or colored with Colorant Chromatics™ by Avient
- Approved for food contact (FDA, EU)



RES

HIGH TEMPERATURE RESISTANCE

EXCELLENT WATER & STEAM RESISTANCE

FOOD-CONTACT APPROVED

ULTRASON®



**FOR HOUSEHOLD
AND CATERING**

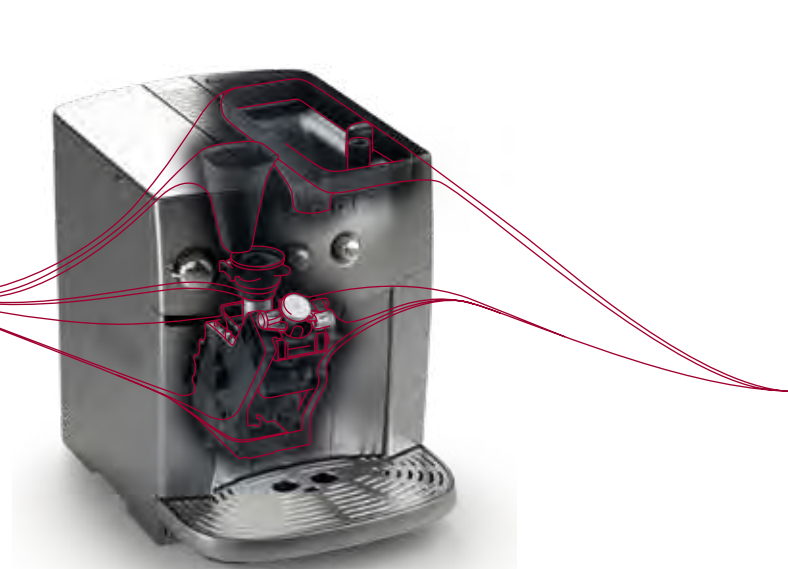
ULTRASON®

KEY PROPERTIES

Outstanding chemical resistance

When evaluating the durability of Ultrason® components against chemicals, the temperature of the medium and particularly the internal and external stresses that act on the molding must be considered. Owing to its amorphous morphology, Ultrason® is susceptible to stress cracking in the presence of certain organic solvents. As the molecular weight of Ultrason® increases, the resistance to chemicals improves, and the likelihood of stress cracking decreases. Glass-fiber reinforced grades are considerably more resistant to chemicals and less susceptible to stress cracking than unreinforced products. The susceptibility to stress cracking can be improved by annealing Ultrason® for several hours.

Even at elevated temperatures, Ultrason® is resistant to water, aqueous solutions, aqueous mineral acids, organic acids, alkalis, aliphatic hydrocarbons, alcohols, amines, most cleaning and sterilizing agents, oils and fats. Moreover, Ultrason® E is stable to oxidizing agents such as hydrogen peroxide or fluorine. Components made of Ultrason® E also withstand short-term exposure to aromatic solvents, e.g., benzene, xylene, or toluene. The same applies to esters, ketones, and certain halogenated hydrocarbons, which can, however, start stress cracking and have a partly dissolving effect in prolonged contact.



ERTIES

Excellent resistance to superheated steam, oils & fats

Materials for kitchen applications must fulfill high requirements on mechanical properties and chemical resistance. Dimensional stability and break resistance from -40 to 220 °C are needed. On top of this, steam, oils, fats, seasonings, food constituents and juices must leave no traces, even at high temperatures. Extensive tests have shown that Ultrason® meets these requirements: It thus represents an unbreakable and lightweight alternative to glass even in applications such as pan lids. Its resistance to hot drinks such as tea or coffee allows it to be used in automatic drinks dispensers or coffee machines for both household and industry.

Components made of Ultrason® can be repeatedly sterilized in superheated steam and largely retain both their transparency and their high level of mechanical properties. Ultrason® P performs extremely well in this case, since its toughness and elongation at break changes very little over many sterilization cycles. The suitability for superheated-steam sterilization increases in the following order: Ultrason® S < Ultrason® E < Ultrason® P.

To counteract stress cracking, the level of residual stress in the components should be kept as low as possible during manufacturing. Likewise, products with the highest possible viscosity should be used. In components made of Ultrason® S and Ultrason® E, mechanical stress during sterilization should be avoided. Thus, up to 100 sterilization cycles are possible. Ultrason® P shows such extremely high resistance to stress cracking that even 2,000 superheated-steam sterilization cycles under load are possible without any crack formation.



ULTRASON®**KEY PROPERTIES****High heat resistance**

Dishes made from Ultrason® easily withstand temperatures up to 220 °C without impairment of their properties. The long-term service temperature is up to 180 °C, based on a heat endurance test over 20,000 hours. Even at these high temperatures the mechanical properties of Ultrason® remain practically unchanged on a very high level over a wide temperature range. These are good reasons for the use of Ultrason® in ovens and grills or for parts such as handles, lids and vents of air fryers.

Certified for food contact

Ultrason® grades are available which fulfill the requirements of the Federal Drug and Cosmetics Act as well as all applicable food additive regulations of the Food and Drug Administration (FDA) for applications in contact with food. Furthermore Ultrason® is listed for food contact according to the European Food Contact regulations and fulfills the Chinese GB standard.



PROPERTIES

Good optical properties

As amorphous thermoplastics, Ultrason® polymers are transparent. Due to the high temperatures necessary during their manufacture and processing they acquire a honey-color tint that prevents the theoretically possible transmission of visible light. The materials are nevertheless suitable for many applications that require transparency. In addition, Ultrason® shows high refractive indices in the visible wavelength range.

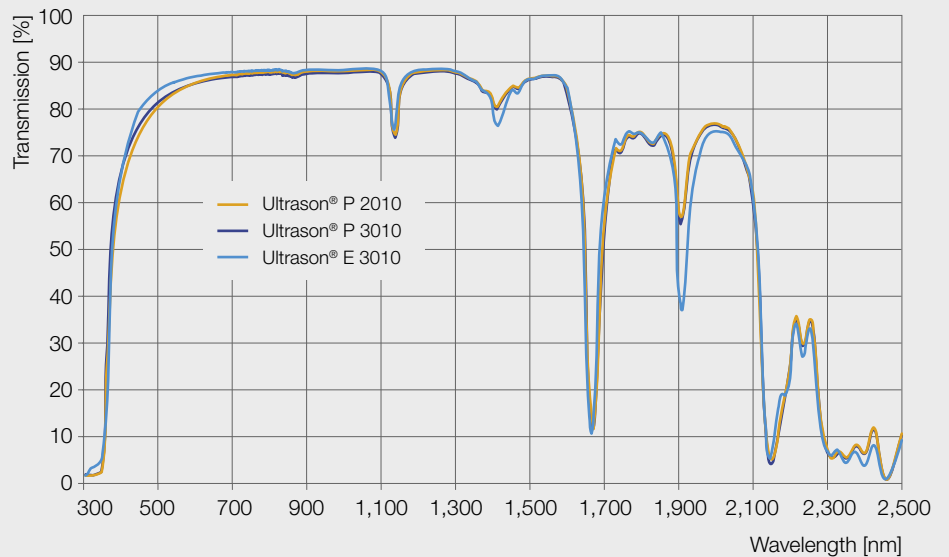


Figure 2: Transmission rates of selected Ultrason® grades



ULTRASON®**KEY PROPERTIES****The colorful world of Ultrason®**

Ultrason® gives outstanding physical properties to high-performance applications in many industries – and Ultrason® is colorful, too! BASF is cooperating with Avient Corporation to globally offer colored grades. These feature BASF's Ultrason® as high-quality base polymer combined with Avient's Colorant Chromatics™ high-temperature color formulation expertise for color concentrates and pre-colored solutions. The colored grades will be formulated and sold by Avient as Colorant Chromatics™ made with Ultrason® by BASF.

Avient uses its proven expertise in formulating colorful Ultrason® to meet also demanding color requirements of tailored applications. Especially in the household and catering industry the request for brilliant colors in both transparent and translucent shades as well as opaque colored materials is high. The base material as well as the colors are food-contact approved according to FDA and EU requirements. So here the proven experience of Avient in combination with the outstanding material properties of Ultrason® will make your application a success!



ERTIES

Benefits

- various-sized orders with short lead times possible
- access to comprehensive technical support from the base polymer to the final-colored product
- meeting technical requirements as well as color standards
- quick reaction times to design trends
- increased speed to market

The full-color Ultrason® portfolio reliably enhances the design of household and catering parts – for stylish and durable home appliances.



ADVANTAGE

IN COMPARISON TO OTHER POLY

The main advantage of Ultrason® compared to other transparent polymers used for household applications: due to its polymer character the mechanical properties remain high and unaffected over a wide temperature range (Fig. 3).

Moreover, you can support a circular economy as products made of Ultrason® can be reused and recirculated many times while maintaining performance and design – in contrast to single-use plastics with short use times or low technical performance.

In comparison to transparent polyamides Ultrason® shows a higher E-modulus, i.e., a higher mechanical stability. Although the base polymer is of a slight honey tint, parts made of Ultrason® do not discolor in usage as parts made of transparent polyamide (PA12) and co-polyesters often do. The temperature resistance of Ultrason® is also much higher than that of PA12 and co-polyesters: the glass transition temperature of PA12 is $< 160^{\circ}$, that of copolyesters $< 130^{\circ}$ C; whereas the glass transition temperatures of Ultrason® grades are 223° C and 225° C. So applications made of Ultrason® can withstand superheated steam sterilization with no problems.

The resistance of Ultrason® to hot water and detergents is higher compared to polyethylene terephthalate (PET) and polycarbonate (PC). Thus dishes, bottles and trays made of Ultrason® can be cleaned in the dishwasher many times.

Ultrason® E and P are the only polymers that meet all demands for microwave applications at temperatures above 100° C due to their high glass transition temperatures of 223° C and 225° C respectively. Usually, it is not possible to choose a temperature in a microwave oven, only wattage and time. So, temperatures even far above 100° C can occur. But even at such temperatures, migration of trace components is, due to the high glass transition temperatures, very limited.

ES MERS

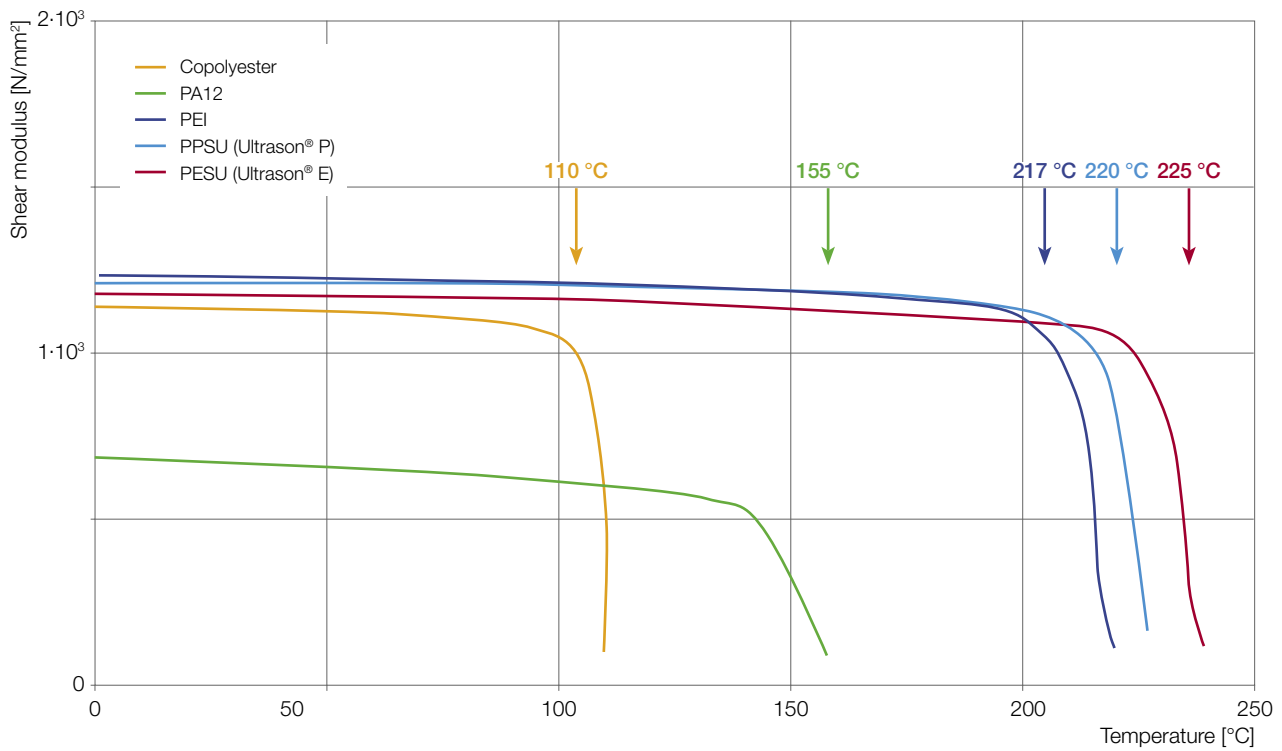
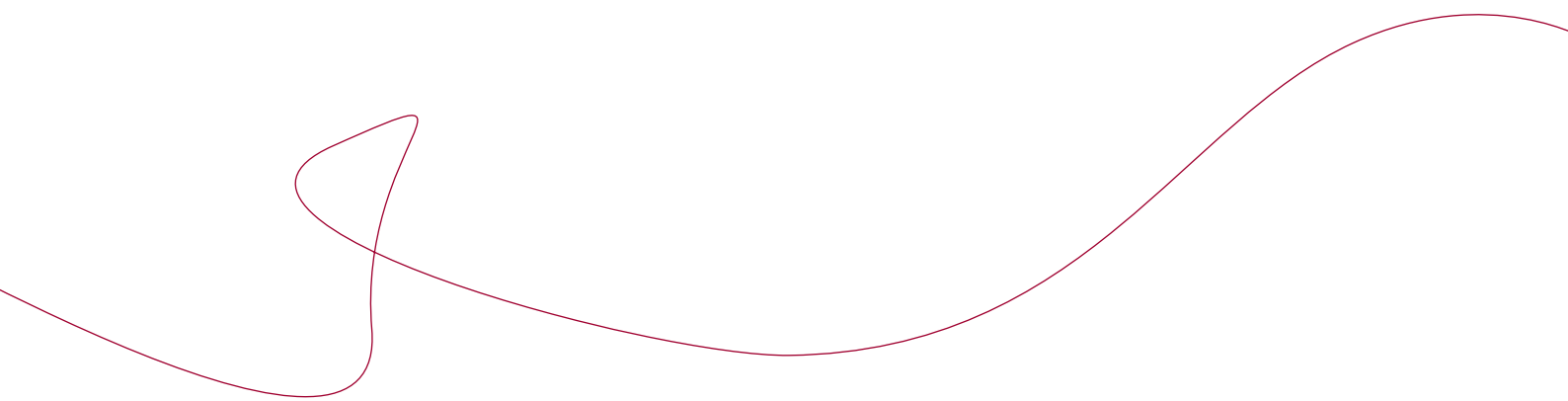


Figure 3: Glass transition temperature: Unlike other polymers, e.g. PA12 or copolyesters, Ultrason® shows no changes in mechanical properties over a broad temperature range.





Ultrason® is the ideal choice, if you want to support a circular economy:
You can avoid single-use plastics and reduce packaging waste caused by
catering, take-away and to-go articles.

With our high-performance specialty polymer you can develop reusable, high-quality and stylish catering articles with exceptional use properties over a long life-time. Products can be reused and recirculated many times while maintaining performance and design.

Thus, reusable catering and to-go articles made of Ultrason® can be part of a multi-cycle system that saves valuable resources and avoids packaging waste as targeted in the Single-Use Plastics EU Directive 2019/904.



REUSABLE

WITH ULTRASON® AND CHANGE TO A SUSTAINABLE LIFESTYLE

With Ultrason®, you can develop a variety of sustainable applications

- Reusable to-go mugs for tea, coffee, juices – hot or cold
- Stylish and durable tea/hot water bottles
- Lightweight catering dishes in planes and trains for recirculation
- Microwavable tableware for catering in schools, hospitals and enjoying meals at home
- Durable, safe and reusable tableware for fast food restaurants

Sustainability benefits

- Improve resource efficiency by using durable catering articles.
- Extend use time of tableware by longer life cycle than other products – porcelain breaks easily.
- Change to high-purity thermoplastics, ensuring safe use also after repeated usage and cleaning.
- Reduce packaging waste by changing from single-use to multiple-use to-go articles.
- Be aware of the value of packaging by consciously deciding for high-quality articles for everyday life.
- Improve resource efficiency by saving weight and therefore fuel and transportation energy.
- Support a circular economy in the food industry by longer life cycle than products made of other materials.





FOR UN

APPLICATION POSSIBILITIES

Catering applications

Modern catering requires partitioned or multi-portion high-heat pans, lids and trays which ideally combine functionality and design. Reusable trays and bowls made from Ultrason® can be adapted to the most varied menu plans: With them, foods can be cooked or deep-frozen and reheated using microwaves or convection heaters. At the same time different types of closure systems, such as sealing or shrink film, can be employed. The trays can be cleaned without difficulty and, if necessary, can also be sterilized. The heat resistance together with the resistance to food ingredients and washing agents allows the trays to be recirculated between 20 to 100 times.

Compared with porcelain tableware Ultrason® trays are characterized by their low weight and their high break resistance. With regard to shape and color practically no bounds are set to design ideas. Whether in the travel, sports or medical sectors, trays made from Ultrason® are attractive and compatible with the environment because of their reusability: They are increasingly preferred over single-use solutions made from aluminum or other plastics.

Especially in aerospace catering, meal trays and bowls made from Ultrason® are an excellent alternative due to their high-quality appeal for the passengers and their outstanding cost and durability benefits for the airlines.



LIMITED TIES

Non-stick coating

Non-stick coatings are a long-standing application of Ultrason® in the food sector. In combination with PTFE (polytetrafluorethylene) Ultrason® produces non-stick, readily cleanable surfaces familiar in cookware like pans, many kitchen helpers and electric devices used for baking and rice cooking. It can also be applied to bakeware and machine equipment that industrial bakeries and food processing companies use to produce pastries, pasta and convenience food in a larger scale. Parts coated with Ultrason® are steam, fat and oil resistant. They show a high heat resistance and no discoloration by food contact.

Ultrason® displays good adhesion to metal. It can be manufactured both by coil coating and spray coating: In coil coating (ruler coating) a metal sheet is coated by through-pass of paint-covered rollers. The part gets its shape after coating (post forming). In spray coating one or two coating layers are added by spraying the formed bakeware item.



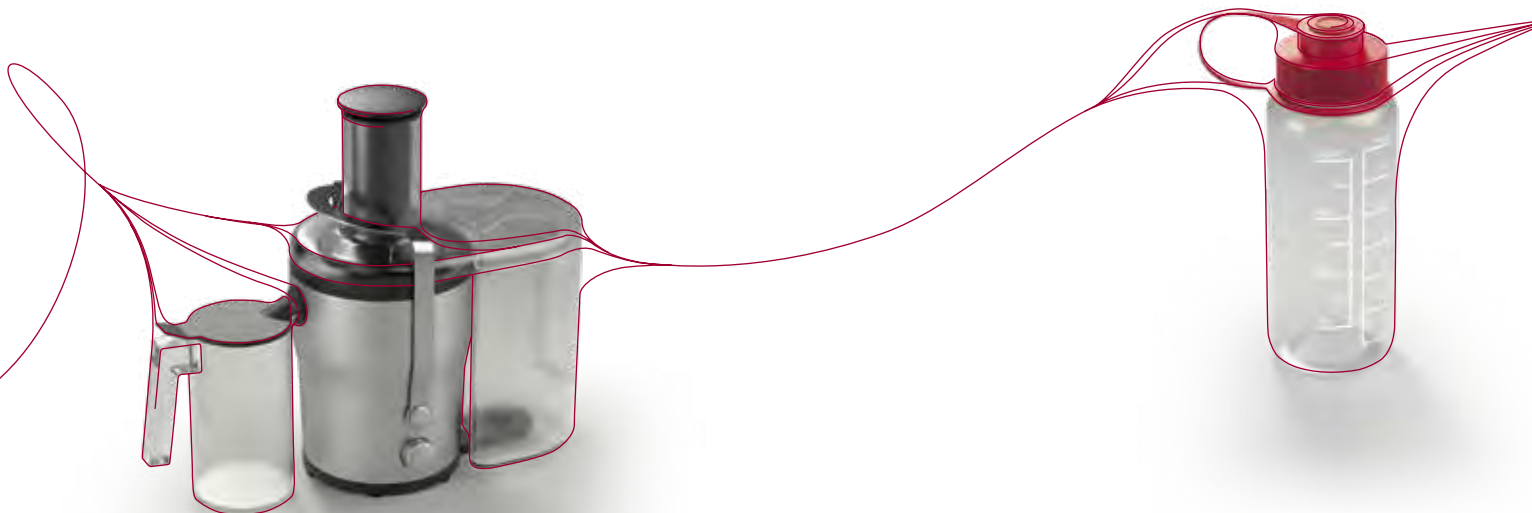
FOR UN APPLICATION POSSIBILITIES

Household appliances

Ultrason® is the perfect material for parts in household machines like water kettles, juicers and food processors. Due to its temperature resistance for long-term usage up to 180 °C (short-term up to 220 °C) and its good mechanical properties regarding toughness and impact resistance, Ultrason® can be used for lids, bowls and utensils as well as level indicators, covers, bodies or screw parts. These applications can be manufactured in transparent or colored. Ultrason® also shows exceptional chemical resistance, e.g. to oils, acids and alkali. It can also be exposed to superheated steam and multiple sterilization processes without any loss of its properties and visual appearance.

Drinking bottles

Ultrason® is the ideal material for manufacturing high-quality, safe and stylish drinking bottles. It is food contact compliant in the US, the EU and China and shows no discoloration by contact with all kinds of juices and softdrinks as well as green or black tea. Bottles made of Ultrason® are lightweight, shatter-proof and exhibit good transparency. They are suitable for superheated steam sterilization and easily withstand the high temperatures in dishwashers as well as microwave ovens without losing their excellent mechanical properties or their optical appearance.



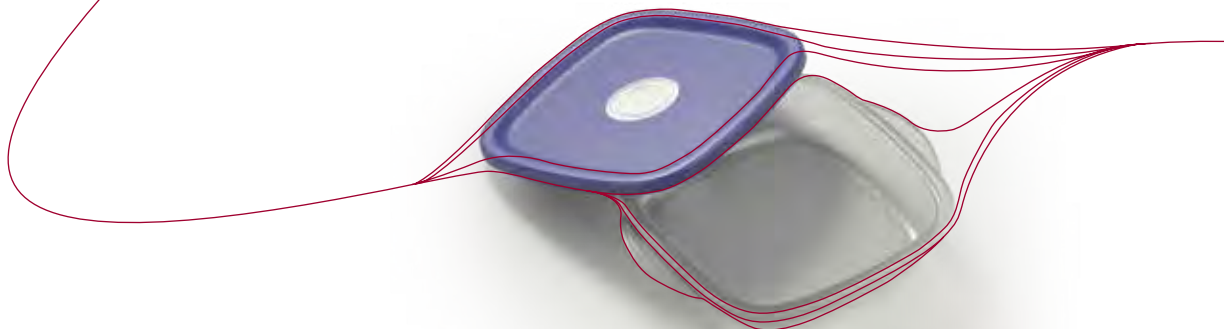
LIMITED TIES

Microwaveable dishes

Ultrason® is permeable to microwaves. It withstands without difficulty the high temperatures which can arise when heating food in a microwave oven. In contrast to many other plastics this resistance extends even to oils and fats.

Ultrason® E and P are the only polymers that meet all demands for microwave applications at temperatures above 100 °C due to their high glass transition temperatures of 223 °C and 225 °C respectively.

Dishes made from Ultrason® can be repeatedly cleaned in dishwashers under standard industrial conditions without loss of properties. Since even strongly colored constituents of food such as curry or tomato ketchup do not stain parts made of Ultrason® even at high temperatures, the material is suitable for trays, plates, bowls and dome covers in transparent or colored.



BEST IN CONTACT

BASF tested the stress cracking resistance of Ultrason® to different foods, cleaning agents and care products so that household and catering articles keep their high performance during their entire lifetime and in different stages of usage: when in contact with food, when being cleaned and when touched in handling.

The test results help to better assess the behavior of Ultrason® in the presence of specific media. The tables on pages 24 to 29 give information on stress cracking at room temperature following short-term contact (contact duration of one minute or 24 hours). For this purpose, stresses were created in tensile bars by clamping them on bending blocks of different radii.

These specimens, while under stress, were brought in contact with the medium. The extent of the damage (crack formation) was evaluated in five categories from “no cracks” to “test bar is broken”.

The result: The test bars made of the different Ultrason® grades showed no stress cracks or discoloration.



EXTEN- SIVE TESTING



**Ultrason® in contact
with food**

**Ultrason® in contact
with cleaning products**

**Ultrason® in contact
with care products**

ULTRASON®

IN CONTACT WITH FOOD

Stress cracking of test bars made of Ultrason® in presence of different foods

Test medium	Test condition	Ultrason® E 2010	
		ESCR	Discoloration
Baby porridge, carrot-red lentis	pre-heated in microwave, followed by 24 h/RT	0	no
Balsamic vinegar	24 h/RT	0	no
Beef tallow (simulating Hamburger grease)	Oven at 149 °C/24 h	n.a.	n.a.
Beetroot	24 h/RT	0	no
Black Tea	6 tea bags poured with 1.7 l of water followed by 24 h/RT	0	no
Butter	Oven at 149 °C/24 h	n.a.	n.a.
Buttermilk	24 h/RT	0	no
Carott juice	96 h/RT	0	no
Cheese sauce	pre-heated in microwave, followed by 24 h/RT	0	no
Coffee creamer	24 h/RT	0	no
Curry	in oil, 5 min at 800 W followed by 24 h/RT	0	no
Curry	in oil, 60 min at 180 °C in oven	0	no
Dark soya sauce	24 h/RT	0	no
Margarine*	Oven at 149 °C/24 h	n.a.	n.a.
Mayonnaise	24 h/RT	0	no
Milk	pre-heated in microwave, followed by 24 h/RT	0	no
Mustard	24 h/RT	0	no
Paprika	in oil, 5 min at 800 W followed by 24 h/RT	0	no
Paprika	dissolved in hot water followed by 24 h/RT	0	no
Paprika	in oil, 60 min at 180 °C in oven	0	no
Peanut oil*	Oven at 149 °C/24 h	n.a.	n.a.
Red Cabbage	30 min at 100 °C in oven	0	no
Saffron	in oil, 5 min at 800 W followed by 24 h/RT	0	no
Saffron	in oil, 60 min at 180 °C in oven	0	no
Tomato paste	24 h/RT	0	no
Tomato sauce	1 h/180 °C in oven	0	no
Tomato sauce	48 h/RT	0	no
Tumeric	in oil, 5 min at 800 W followed by 24 h/RT	0	no
Tumeric	in oil, 60 min at 180 °C in oven	0	no
Vegetable oil*	Oven at 149 °C/24 h	n.a.	n.a.
Vinegar (~5% acetic acid)**	Oven at 149 °C/24 h	n.a.	n.a.

* Margarine, vegetable oil and peanut oil left a thin film residue on samples that would not clean off with dawn soap and light scrubbing

** Overall test using vinegar with corn starch not believed to be robust enough to give credible consistent results

RT = Room temperature

ESCR = Environment Stress Cracking



Ultrason® E 3010		Ultrason® P 2010		Ultrason® P 3010	
ESCR	Discoloration	ESCR	Discoloration	ESCR	Discoloration
0	no	0	no	0	no
0	no	0	no	0	no
0	no	n.a.	n.a.	0	no
0	no	0	no	0	no
0	no	0	no	0	no
0	no	n.a.	n.a.	0	no
0	no	0	no	0	no
0	no	0	no	0	no
0	no	0	no	0	no
0	no	0	no	0	no
0	no	0	no	0	no
0	no	0	no	0	no
0	no	0	no	0	no
0	no	0	no	0	no
0	no	n.a.	n.a.	0	no
0	no	0	no	0	no
0	no	0	no	0	no
0	no	0	no	0	no
0	no	0	no	0	no
0	no	0	no	0	no
0	no	0	no	0	no
0	no	0	no	0	no
0	no	0	no	0	no
0	no	n.a.	n.a.	0	no
0	no	0	no	0	no
0	no	0	no	0	no
0	no	0	no	0	no
0	no	0	no	0	no
0	no	0	no	0	no
0	no	0	no	0	no
0	no	0	no	0	no
0	no	0	no	0	no
0	no	0	no	0	no
0	no	0	no	0	no
0	no	0	no	0	no
0	no	0	no	0	no
0	no	n.a.	n.a.	0	no
0	no	n.a.	n.a.	0	no

0 = no cracks 1 = hardly visible 2 = hairline, plenty of stress cracks 3 = long/deep stress cracks 4 = test bar is broken

ULTRASON®

IN CONTACT WITH CLEANING PRODUCTS

Stress cracking of test bars made of Ultrason® in presence of different cleaning products

Test medium	Test condition	Ultrason® E 2010	
		ESCR	Discoloration
Citric acid	100 ml citric acid diluted with 1.7 l of hot water followed by 24 h/RT	0	no
Coffee machine cleaner (Tablets)	1 tablet (2 g) dissolved in hot water followed by 24 h/RT	0	no
Coffee machine descaler	100 ml descaler dissolved in 1.7 l hot water followed by 24 h/RT	0	no
Degrease spray	24 h/RT	0	no
Detergent	1 table spoon dissolved in hot water followed by 24 h/RT	0	no
Label remover	3 h/RT	0	no
Milk system cleaner	100 ml cleaner diluted with 1.7 l of hot water followed by 24 h/RT	0	no
Oven cleaner & grill cleaner	24 h/RT	0	no
Solid Brilliance* 0.025%	24 h/88 °C	n.a.	n.a.
Solid Metal Pro** 0.29%	24 h/88 °C	n.a.	n.a.
Vinegar essence	24 h/RT	0	no

* Solid Brilliance chemical composition: Oxirane, methyl-,polymer with oxirane, Concentration: 60-100 %; Urea, Concentration: 10-30 %; Propylene Glycol, Concentration: 1-5 %

** Solid Metal Pro chemical composition: Sodium Metasilicate, Concentration: 30-60 %; Sodium Carbonate (soda), Concentration: 10-30 %

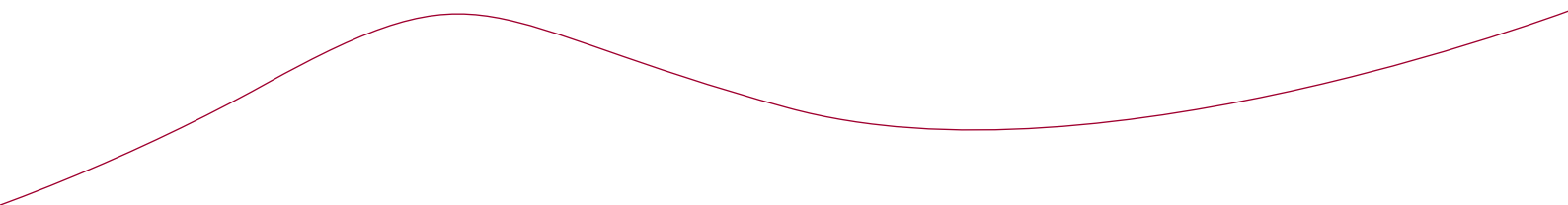


PRODUCTS



Ultrason® E 3010		Ultrason® P 2010		Ultrason® P 3010	
ESCR	Discoloration	ESCR	Discoloration	ESCR	Discoloration
0	no	0	no	0	no
0	no	0	no	0	no
0	no	0	no	0	no
0	no	0	no	0	no
0	no	0	no	0	no
0	no	0	no	0	no
0	no	0	no	0	no
0	no	0	no	0	no
0	no	0	no	0	no
2	no	n.a.	n.a.	2	no
2	no	n.a.	n.a.	2	no
0	no	0	no	0	no

0 = no cracks 1 = hardly visible 2 = hairline, plenty of stress cracks 3 = long/deep stress cracks 4 = test bar is broken



ULTRASON®

IN CONTACT WITH CARE PRODUCTS

Stress cracking of test bars made of Ultrason® in presence of different care products

Test medium	Test condition	Ultrason® E 2010		Ultrason® E 3010	
		ESCR	Discoloration	ESCR	Discoloration
Argan oil	24 h/RT	0	no	0	no
Baby care oil	24 h/RT	0	no	0	no
Body lotion	24 h/RT	0	no	0	no
Care cream	24 h/RT	0	no	0	no
Day cream	24 h/RT	0	no	0	no
Face cream men	24 h/RT	0	no	0	no
Hair gel	24 h/RT	0	no	0	no
Hand cream	24 h/RT	0	no	0	no
Sun cream	24 h/RT	0	no	0	no



®

CTS

Ultrason® P 2010		Ultrason® P 3010	
ESCR	Discoloration	ESCR	Discoloration
0	no	0	no
0	no	0	no
0	no	0	no
0	no	0	no
0	no	0	no
0	no	0	no
0	no	0	no
0	no	0	no
0	no	0	no

0 = no cracks
 1 = hardly visible
 2 = hairline, plenty of stress cracks
 3 = long/deep stress cracks
 4 = test bar is broken

ULTRASON®





STYLISH DURABLE AND SAFE

Please note:

The figures given here are standard values obtained from a representative number of measurements. They refer to uncolored material. The standard values cannot be extrapolated to moldings of arbitrary geometry without reservation. As with other thermoplastics, the geometry of the molding and the processing conditions have to be taken into consideration.

Contact

Details on the individual products can be found in the range chart on Ultrason®. Technical data on specialty and development products are available from the Ultraplaste Infopoint upon request: ultraplaste-infopoint@basf.com. Our team of experts will gladly answer any questions you have!

Coffee machine on title page shown with kind permission of De'Longhi, Treviso.



Explore the full potential of Ultrason® and find the suitable grade for your application!
Ultrason® Product Selector on www.ultrason.basf.com

Further information on Ultrason® can be found on the internet:

www.ultrason.basf.com

Please also visit our websites:

www.plastics.basf.com

Request of brochures:

plas.com@basf.com

If you have technical questions on the products, please contact the Ultra-Infopoint:**Note**

The data contained in this publication are based on our current knowledge and experience. In view of the many factors that may affect processing and application of our product, these data do not relieve processors from carrying out own investigations, and tests; neither do these data imply any guarantee of certain properties, nor the suitability of the product for a specific purpose. Any descriptions, drawings, photographs, data, proportions, weights etc. given herein may change without prior information and do not constitute the agreed contractual quality of the product. It is the responsibility of the recipient of our products to ensure that any proprietary rights and existing laws and legislation are observed. (September 2023)



Ultrason® by BASF

HARD FACTS

Property/Material	PP	Co-polyester	PET	PC	Amorphous PA	PEI	PESU Ultrason® E	PPSU Ultrason® P
Optical quality, aesthetical appearance	- milky	++	++	++	++	- yellow	+ Slight honey tint	+ Slight honey tint
Dishwasher and detergent resistance	+/-	+/-	+/-	-	+	+	+	+
Microwave resistance	-	-	-	-	+	-	++	++
Hot steam resistance (sterilization)	-	-	-	-	-	+	++	++
Mechanical properties at high temperatures	-	-	-	+	+	++	++	++

Table 1: Comparison of transparent materials for household and catering applications

- : poor
 +/- : acceptable
 + : good
 ++ : excellent

BEST VALUES

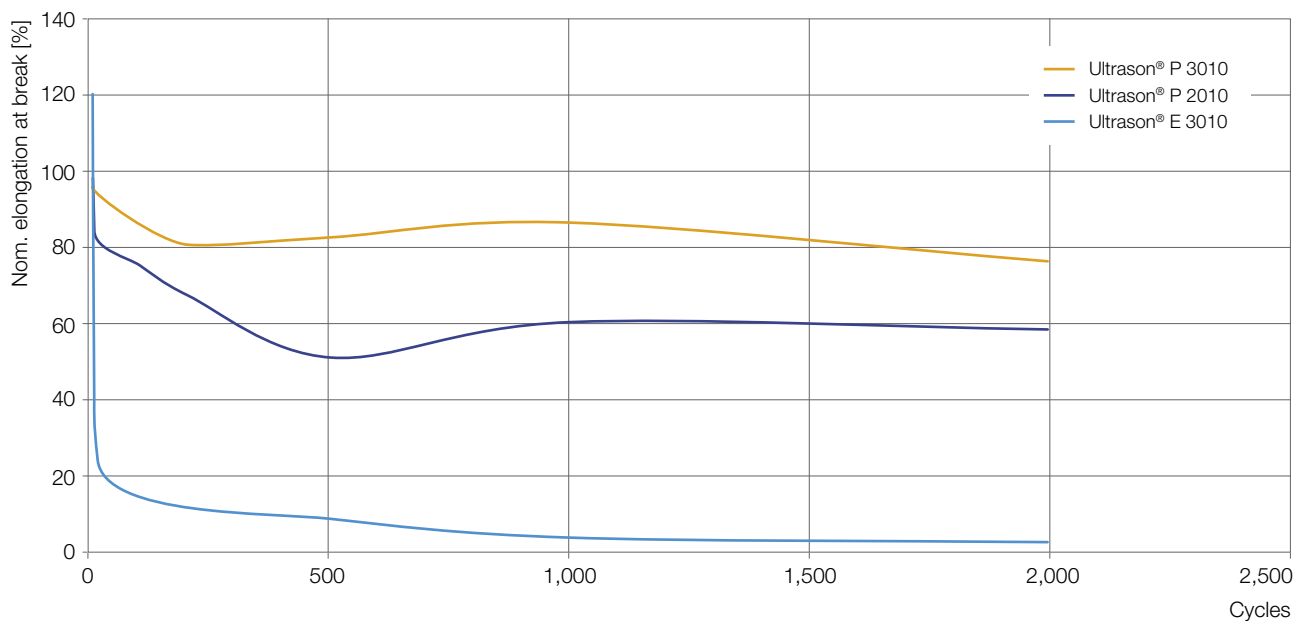


Figure 4: Hot steam sterilization of different Ultrason® grades at 134 °C:
influence on nominal elongation at break

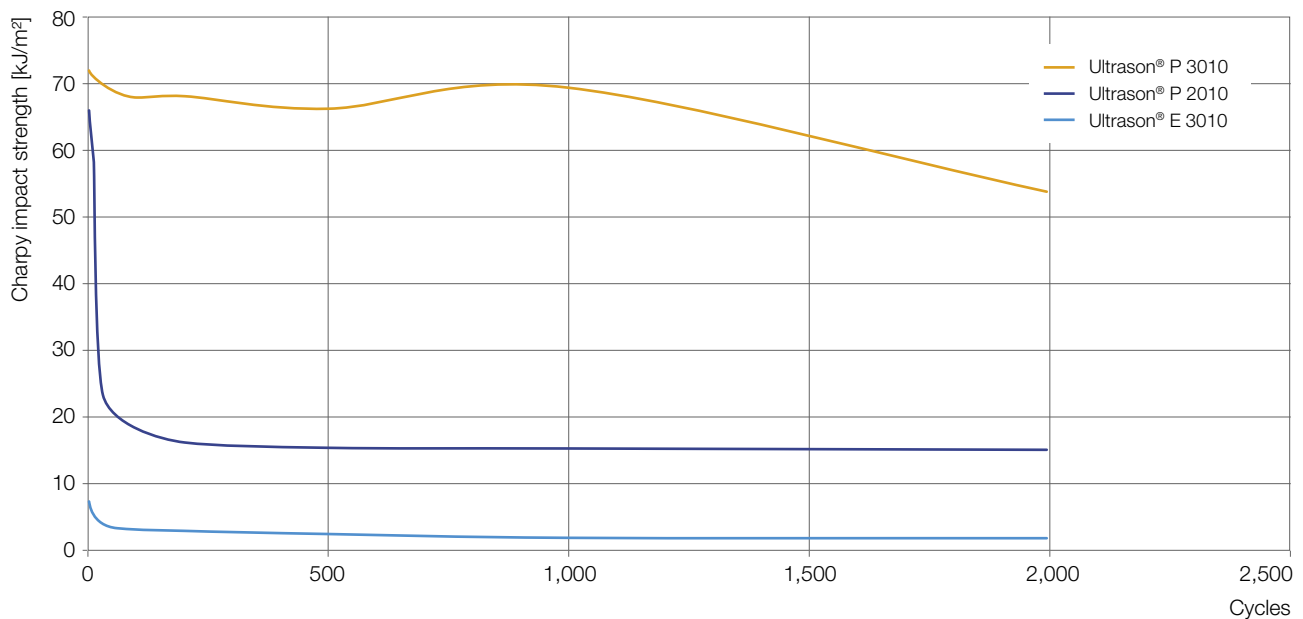


Figure 5: Hot steam sterilization of different Ultrason® grades at 134 °C:
influence on Charpy impact strength