

Ultrason® for household and catering

Stylish, durable and safe



 **BASF**
We create chemistry

ULTRASON®

A woman with dark curly hair is shown from the chest up, wearing a brown top. She is holding a white Ultrason blender jar filled with a green smoothie to her lips and drinking. The background is a kitchen setting with a wooden countertop, a glass of water, and some fruit (strawberries and an orange) visible. The brand name 'ULTRASON' is overlaid in large white letters, with a registered trademark symbol (®) to the right of the word 'SON'. A small red square is located below the registered trademark symbol.

CONTENTS

ULTRASON® FOR HOUSEHOLD AND CATERING	4-5
KEY FEATURES	6-7
KEY PROPERTIES	8-11
ADVANTAGES OF ULTRASON® IN COMPARISON TO OTHER POLYMERS	12-13
FOR UNLIMITED APPLICATION POSSIBILITIES	14-17
<ul style="list-style-type: none">▪ CATERING APPLICATIONS▪ NON-STICK COATING▪ HOUSEHOLD APPLIANCES▪ DRINKING BOTTLES▪ MICROWAVEABLE DISHES	
TECHNICAL DATA	18-19

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.

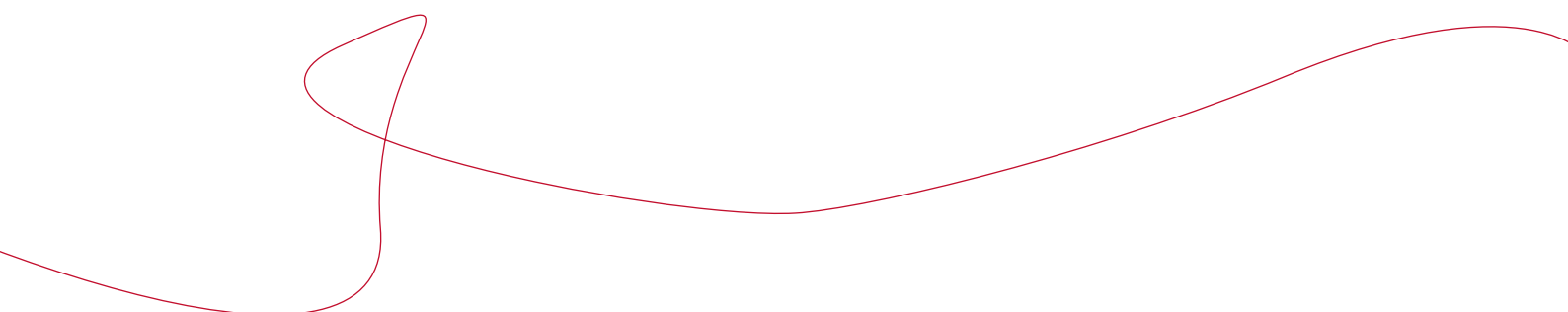
Ultrason® is the trade name for BASF's product range of polyethersulfone (Ultrason® E), polysulfone (Ultrason® S), and polyphenylsulfone (Ultrason® P). It includes reinforced and

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 as transparent or in base colors
- Easy self-coloring with masterbatch solutions
- Approved for food contact (FDA, EU)



RES



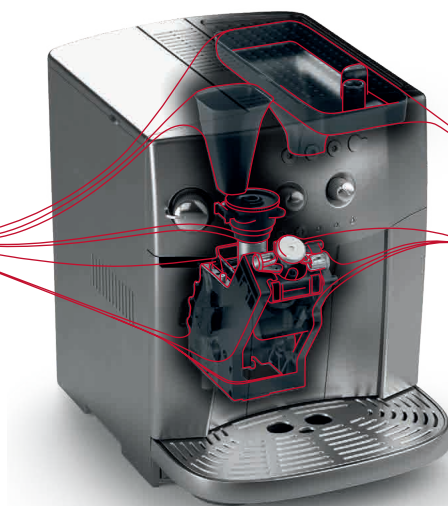
FOR HOUSEHOLD AND CATERING

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® E < Ultrason® S < 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, the three 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.

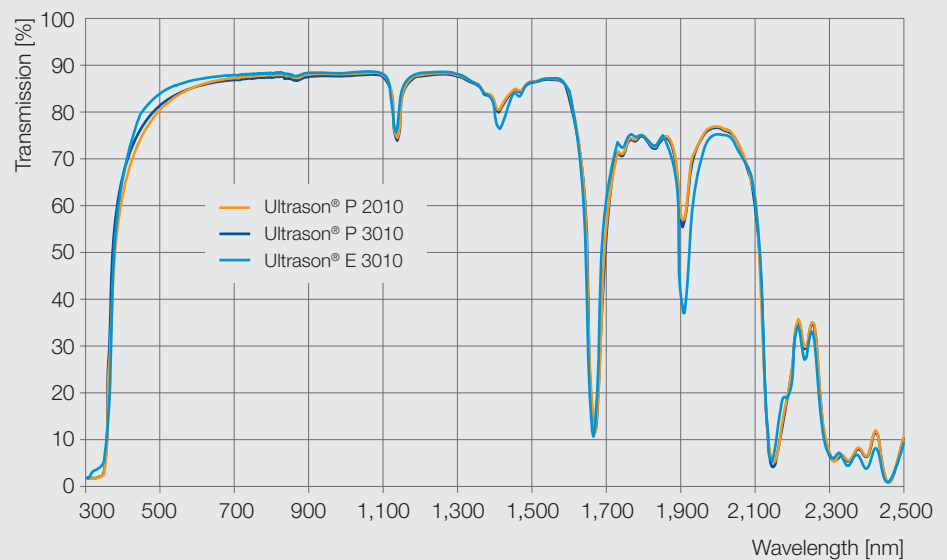


Figure 2: Transmission rates of selected Ultrason® grades



ADVANTAGE

IN COMPARISON TO OTHER POLY

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

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

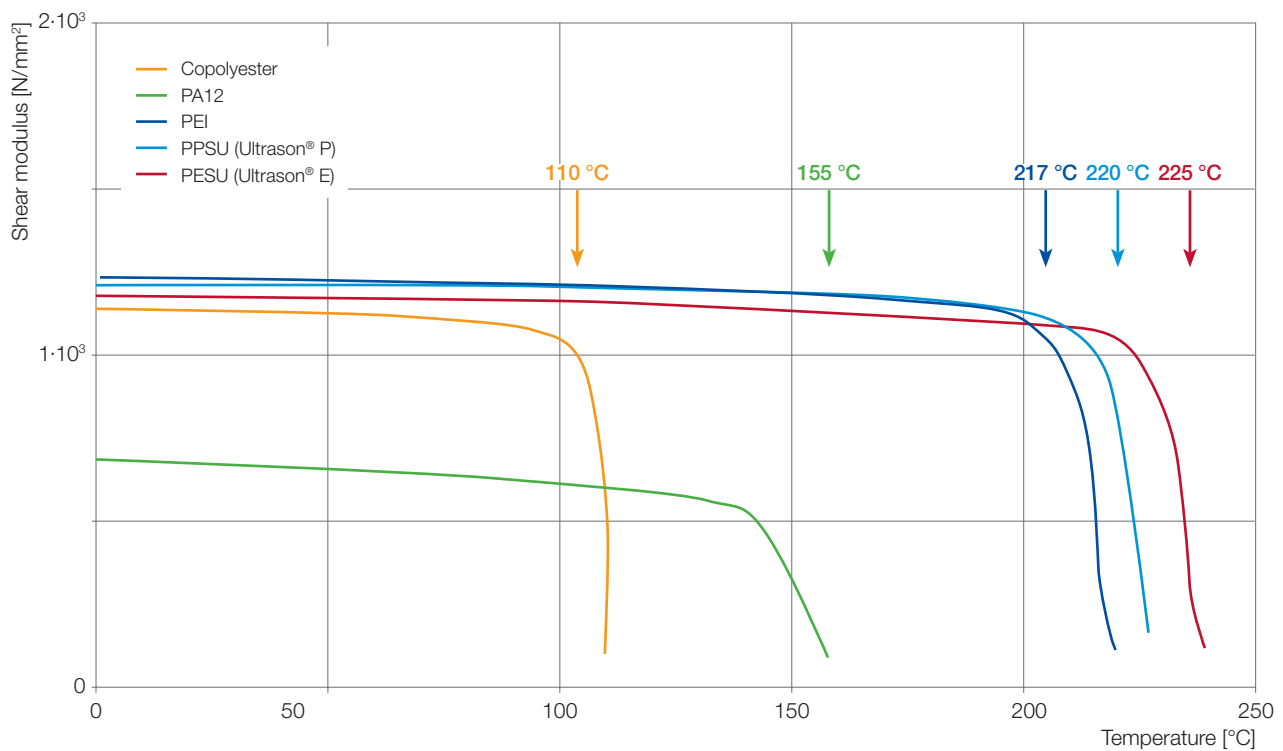


Figure 3: Glass transition temperature: Unlike other polymers, e.g. PA12 or copolyesters, Ultrason® shows no changes in mechanical properties over a broad temperature range.



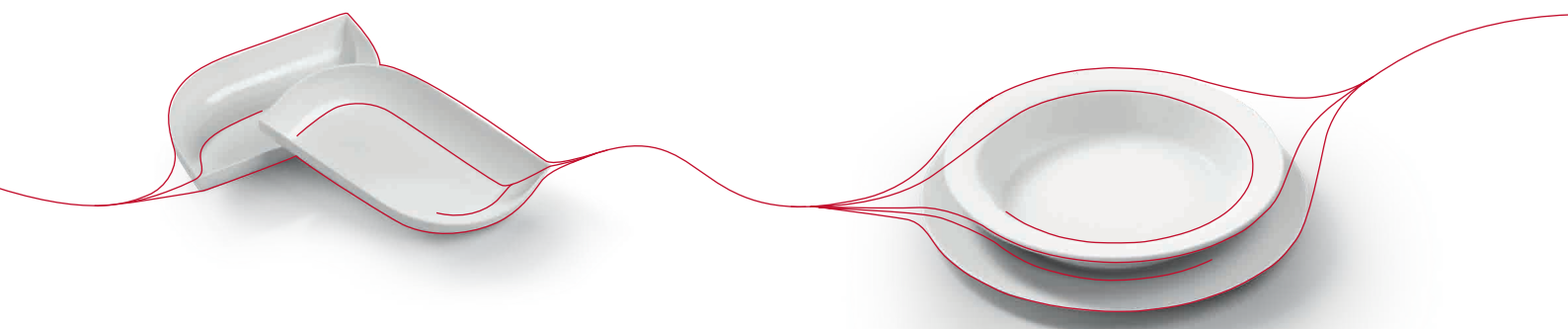
FOR APPLICATION POSSIBILITIES

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.



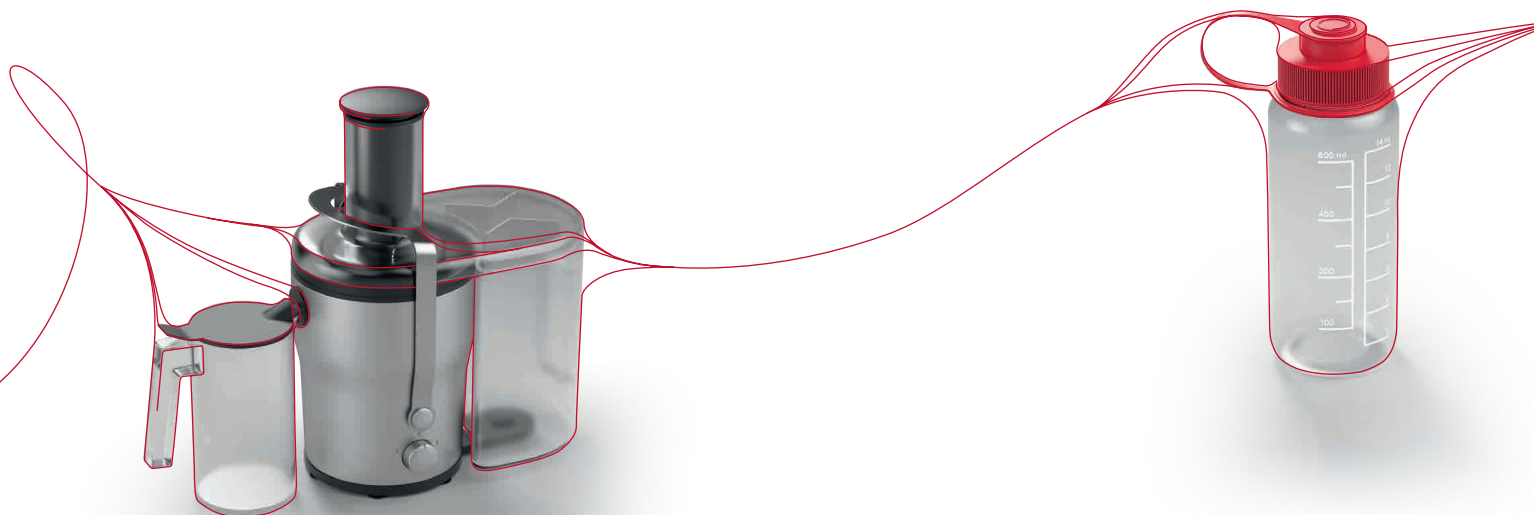
FOR UN APPLICATION POSSIBILITIES

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.



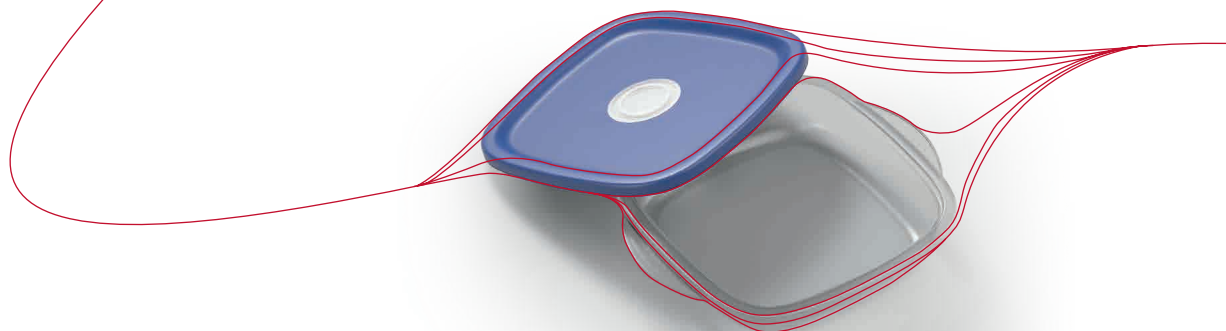


Microwaveable dishes

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.



ULTRASON®



A person is pouring orange juice from a blender into a glass. The blender is silver and black. The glass is green. The background is a kitchen with various items on the counter.

STYLISH DURABLE AND SAFE

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

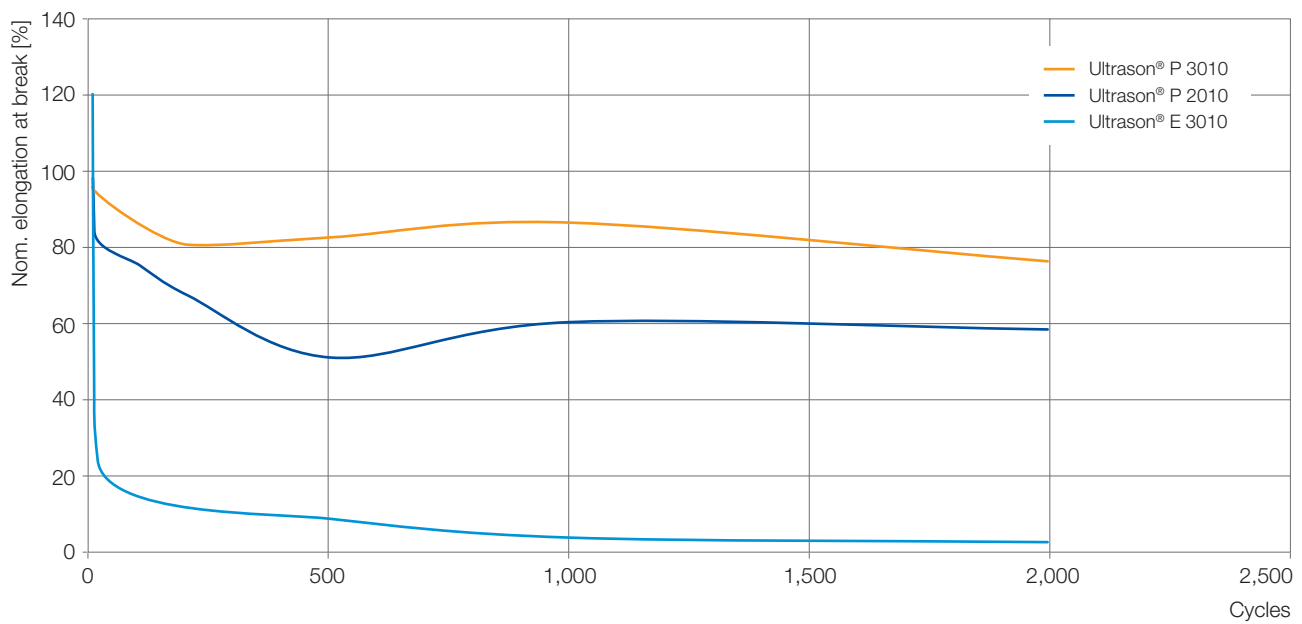


Figure 4: Hot steam sterilization of different Ultrason® grades at 134 °C:
influence on nominal elongation at break

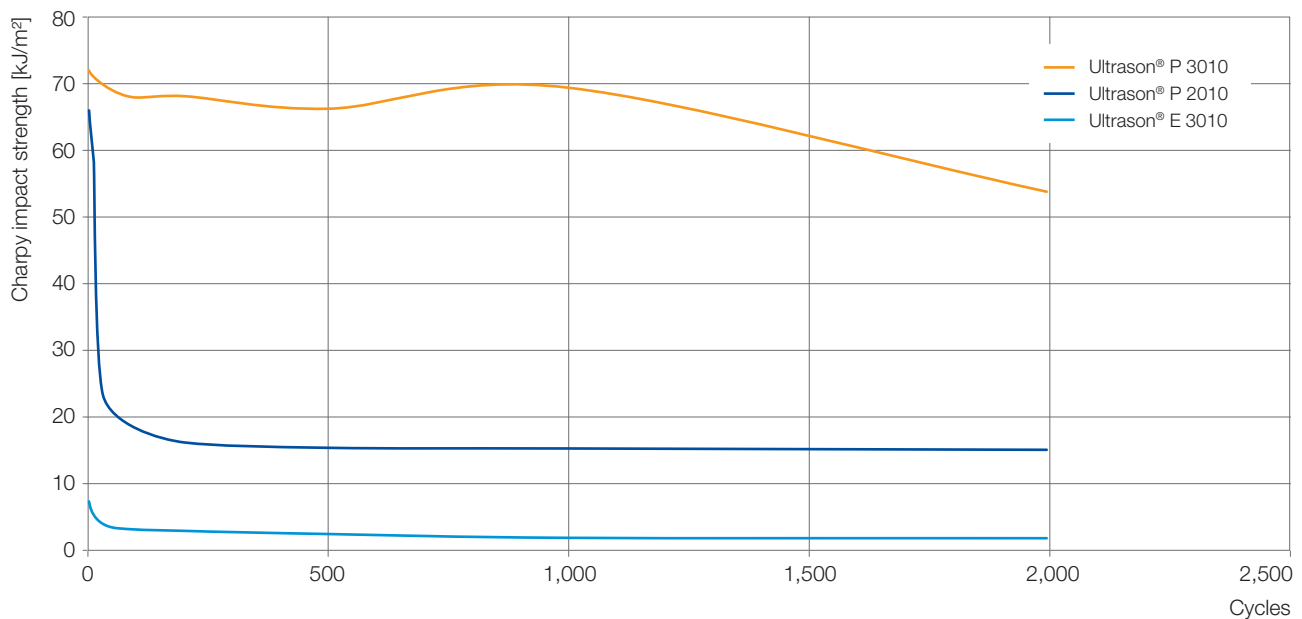


Figure 5: Hot steam sterilization of different Ultrason® grades at 134 °C:
influence on charpy impact strength

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.

**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

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