

# Plastic Additives

Your key components for reliable performance  
in the building & construction industry



We create chemistry

# // Adding value to plastics

**The choice of the best plastic additives is a crucial factor for success in plastic applications. It calls for a reliable partner who not only offers a wide product portfolio but can also provide innovative solutions that can fulfill today's and tomorrow's requirements.**

Long-standing expertise and a toolbox approach make BASF the best partner for innovative and customized solutions. New developments and continuous improvement of its portfolio as well as close cooperation with its customers enables BASF Plastic Additives to drive sustainability and reliability in all kinds of plastic applications.

Plastics are valuable materials that offer safe, durable, and cost-efficient solutions. In many cases the use of plastics can be more sustainable than the use of other materials. BASF Plastic Additives offers products that can help to mitigate negative impacts on the environment and also by extending and closing the loop in the circular economy of plastics.

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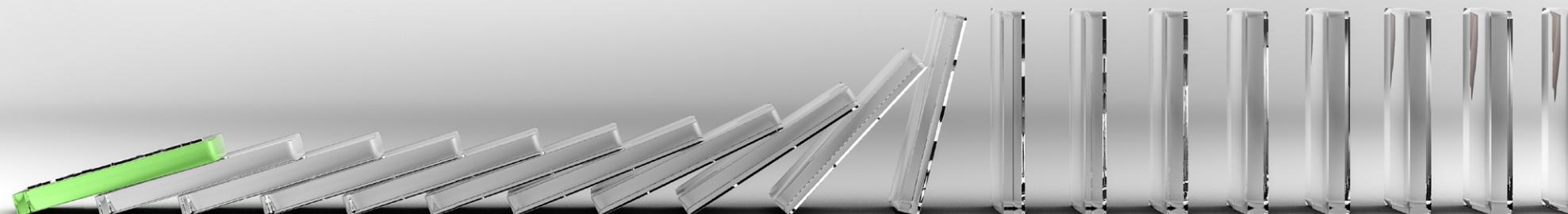
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# / Additives, the enablers for plastic

Plastics are an essential resource in a multitude of applications where they provide outstanding performance in light weighting, ease of use, and functionality. Offering high durability where needed, reliable quality, and safety, they play a vital role in raising living and hygiene standards as well as improving the resource and energy balance.

Public opinion usually associates plastic with single-use products, which might be a reason why plastics have a rather poor image, but plastics are used in many essential applications in various industries. Plastic additives are enablers that can actually contribute to more sustainability when incorporated in the value chain of present and future industries.

Plastics offer features and benefits that other materials do not, and in many cases the alternatives do not have a better sustainability profile. Therefore, the main challenges facing the plastics industry today are to improve sustainability along the entire value chain and to reduce or even eliminate plastic waste in the process.

BASF Plastic Additives supports that process by supplying solutions that contribute to longer product lifetimes, safe and reliable use, as well as resource and energy efficiency. Those properties allow to integrate plastics in a more sustainable way in modern value chains.

Adequately stabilized plastics enable a **very efficient** use of resources, especially during the use phase. At the end of their life, plastics are still very valuable **resources that can be transformed** into new feedstock or into energy.

## BASF Plastic Additives help to:

### Improve the sustainability profile

of plastic products by ...

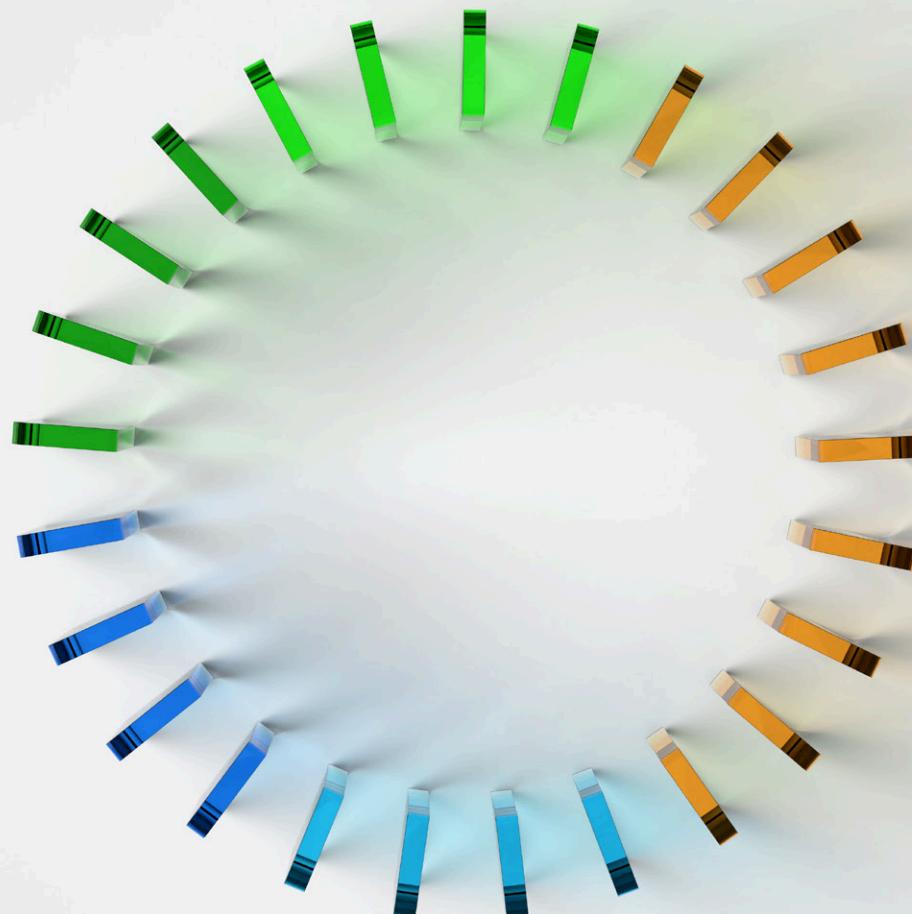
... extending product lifetimes with solutions that increase durability, and improve resistance to thermal, UV and chemical exposure.

... enabling better processing and performance of recycled plastics with the IrgaCycle® toolbox.

### Provide cost-efficient solutions on a global scale by ...

... enabling applications where plastics last longer and require less maintenance than other materials.

... reducing the volume of raw materials and energy needed.



### Ensure the safety and reliability of plastics by ...

... reducing exposure to undesirable by-products and residues with high-quality and extensively tested products.

... enhancing the safety of applications which require fail-safe stability and flame retardancy.

... ensuring that BASF's customers can fulfill and meet regional requirements.



# / VALERAS® creating new VALue for plastics in an ERA of Sustainability

Join us on this journey. Take a look at our customer stories, featured products, and exceptional services to make sustainable plastics a reality.

Plastics fulfill essential tasks in modern industries, which is why they play a substantial role in the shift towards a more sustainable future. With society and customers becoming increasingly aware of the importance of a holistic view of the value chain and cradle-to-grave approaches, plastics can be seen for what they really are: valuable materials that, with the help of additives, become enablers of more sustainability for many industries.

BASF Plastic Additives aims to promote this sustainability and support its customers with high value plastic additives and solutions to meet market needs. Together we can make plastics lighter, stronger, more durable and safer. It is why BASF Plastic Additives has brought its most sustainable products, innovative solutions, regulatory support, and longtime experience under one brand: VALERAS®. The VALERAS® portfolio includes BASF plastics additives that offer significant sustainability benefits for the plastics industry in many categories including improved durability, energy savings, or by reducing emissions.

Beyond that, BASF promotes the acceleration to a circular economy by developing new and innovative solutions to extend and close the loop. Ensuring that the required properties of plastics are maintained over a longer product lifecycle helps to keep them in the loop and thereby save valuable resources. Innovative products such as IrgaCycle® enable recycling of plastics and by enhancing the quality of the resulting material to help close the loop.

BASF also provides support when it comes to compliance with regulatory requirements. RegXcellence® for plastic additives is part of the VALERAS® portfolio and offers targeted access to comprehensive global regulatory support for BASF customers.

VALERAS® by BASF Plastic Additives  
enables customers to achieve their  
sustainability goals.





## / Plastic additives for the **building & construction industry**

Polymeric materials are widely used in building and construction (B&C) applications due to their broad range of physical properties that enable them to replace more traditional materials such as metals, wood, glass and stone.



Advantages in lighter weight, ease of installation, impact strength and resistance to corrosion and rot are among the potential advantages offered by polymer compounds. However, the UV resistance of most polymers requires the incorporation of functional stabilizers to provide enhanced UV protection that meets performance requirements, especially with regard to color stability and to prevent surface photooxidation. Accelerated weathering is widely used to evaluate the performance of different stabilization systems and to help assess service lifetimes of polymer-based products. Various standard test methods exist, and the specific

conditions of irradiance, temperature and moisture are routinely controlled in established testing protocols. Differences in these parameters can affect the relative stability and performance of stabilization systems. In addition, varying outdoor weathering due to geographic differences and solar radiation is also an important consideration for product developers to understand in order to better ensure product performance. Applications range from pipe, roofing, rotomolding, decking, siding, wire & cable, window profiles, glazing, photovoltaic panels, floating photovoltaic, and geosynthetics.





## VALERAS®

Creating value for the  
B&C industry

Plastic additives are crucial when it comes to extending the lifetime of plastics for the building and construction industry. A longer lifetime helps to save costs, resources and emissions. BASF Plastic Additives can deliver even more: its light stabilizers ensure that material and inhabitants are protected against high temperatures, intense UV radiation and other harsh weather conditions. In addition, plastic additives enable high-end solutions for polymers and the improvement of plastics for energy efficient and eco-friendly buildings.

With regulations becoming more and more relevant, BASF Plastic Additives contributes to more eco-friendly plastics in the building and construction sector by optimizing plastic additives' longevity and contributing to high-performance material solutions for long-lasting and safe structures in construction.

## How BASF Plastic Additives **add value to your products**

### **# Cost efficiency**

Plastics often cost less to produce, install and maintain compared to traditional materials used in the B&C industry. Plastic window profiles have better insulating properties than aluminum frames and require less maintenance than wooden ones. Thanks to plastic additives, plastic films enhance the properties of windows, making them safer and more energy-efficient.

### **# Durability**

Plastic additives make plastics very durable and therefore make materials suitable for long-lasting applications. Not only their durability but also their anti-corrosion properties can be enhanced by plastic additives and enlarge the life span of e.g. cables and plastic pipes even up to 50 years. BASF's light stabilizers for PC glazing applications are the standard in the industry and enable outdoor applications up to 20 and more years.

### **# Safety**

Safety is a must in buildings. Plastic additives can contribute to this need by providing flame retardancy to the polymers used in buildings, from scaffolding, flooring, electrical appliances to even smoke detectors and fire alarm systems. BASF's expertise in product stewardship helps players along the B&C value chain to have good working hygiene and safe products for consumers.

### **# Innovation**

Plastics allow architects and designers more freedom of design and inspire them to create buildings with innovative shapes and features. With the help of plastic additives, plastics innovate an extensive design flexibility unmatched by traditional materials. Plastic membranes offer great aesthetic flexibility in applications requiring waterproofing, while plastic glazing is low in weight, allowing for more design freedom and lighter building structures.



## Sustainable buildings are no longer a decision, but a must

As an innovative and reliable global player in the B&C sector with a long history in polymer additives, BASF contributes to more sustainability with a full range of additive solutions for durable, longer lasting plastics and safe structures – from single-ply TPO applications, PE piping applications, PC glazing applications to PVC flooring applications.

## Wood plastic composites, an innovative match

Wood plastic composites (WPC) are sustainable materials, thanks to the high level of recycled plastics used. Their low maintenance and aesthetics are two key elements that make wood plastic composites a highly attractive material. Consisting of wood products such as bark, pulp and bamboo reinforced with polymer matrix or thermoplastics, wood plastic composites are mainly used in extruded floor coverings. However, this innovative product offers many more possibilities for further applications in the construction industry.

Wood plastic composites are durable, rot resistant in nature, require low maintenance, and sustain high temperatures. Furthermore, this material is low in cost and easy to use in areas like balconies, staircases and pillars. As wood plastic composites are a perfect substitute for hard wood, they help prevent deforestation.



BASF Plastic Additives supports its customer with a full range of **solutions for durable, longer lasting plastics and safe structures.**

# Case Study

## Plastic additives for efficiency during and after construction

### BASF's plastic additives solutions help the construction industry contribute to government sustainability goals and meet the quality demands of its customers.

The building and construction industry not only has an impact on climate change, it is itself affected by it. Builders need to ensure that they use plastic that can withstand increasingly extreme weather conditions in terms of durability and visual appearance.

#### Sustainability in building and construction

Since plastics offer many benefits compared to traditional materials such as metal and glass, their use in the construction sector is steadily increasing. Additives allow plastic to be used for a wider range of end products for construction and even increase the profitability and sustainability of the construction process by using recycled plastic. In addition, they decrease the time needed for construction due to easier installation and maintenance.

Thanks to BASF plastic additives, plastic stands out not only for its flexible applications and simplified handling, but also for its increased performance: susceptibility to intense UV radiation, chemical and thermal effects are significantly reduced for long-lasting components. This not only decreases the frequency of maintenance, but also increases the service life of the materials for a more cost-efficient and sustainable

construction. Further positive effects can also be seen after the construction process through the increased energy efficiency of the buildings. This meets not only new standards from government, but also lives up to those of their customers by saving them costs.

#### Long-lasting PC glazing with Tinuvin® 1600

How high-quality plastic additives can contribute to more sustainable and cost-efficient construction sector has been illustrated in a dedicated outdoor study by BASF and Dott.Galina. The material of interest was polycarbonate, a material that is regularly used for glazing buildings since its versatility and durability allow architects greater design freedom, even in harsh climates.

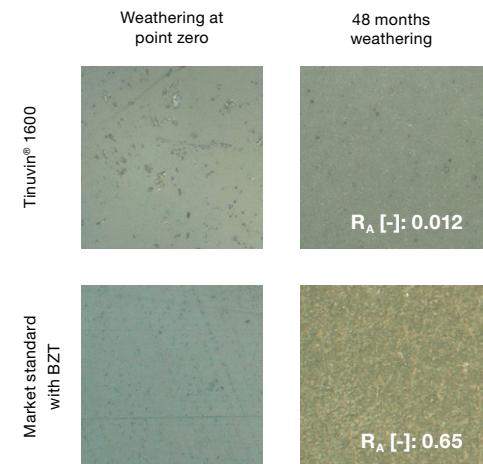
The EMMAQUA® outdoor ultra-accelerated weathering study compared Dott.Galina's crystal and opal multiwall sheets, one with standard UV filters and one with BASF's Tinuvin® 1600, a high-performance UV filter. The weathering exposure during the 48 months in the EMMAQUA® study corresponded to natural aging within 25 years in Florida, USA and 32 years in Basel, Switzerland.

The study showed that at the end of the four years the standard UV filter deteriorated in performance, leading to yellowing and increasing surface roughness of the materials. In contrast, there was minor change in the surface roughness of the multiwall sheets containing Tinuvin® 1600. The yellow index of the crystal multiwall sheets with Tinuvin® 1600 was also only half as high, and that of the opal multiwall sheets only a quarter of the yellow index of the standard UV filters.

These numbers illustrate very clearly how innovative plastic additives from BASF can improve the performance of plastics such as polycarbonate and thereby enlarge the life cycle of plastics in the construction industry.



**Microscopic view of surface roughness**  
(Sample: Opal multiwall sheet)

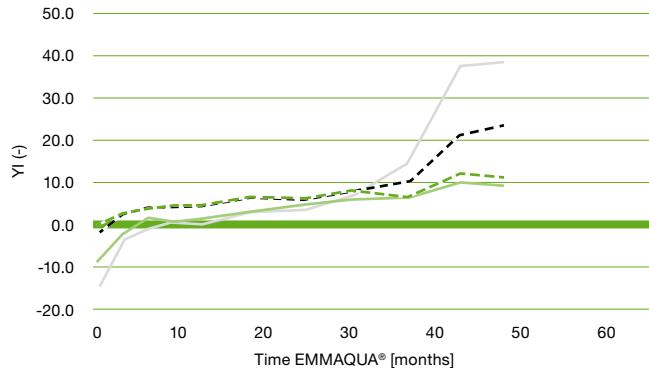


$R_A [-]$ : arithmetical mean deviation of roughness profile (ISO 4287:1996)

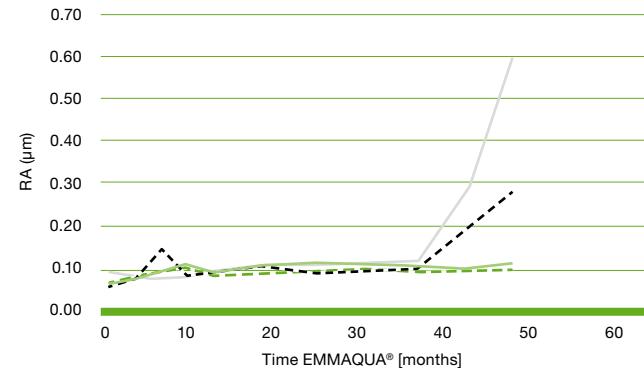


**Yellow index**

Crystal Tinuin® 1600  
Crystal Standard BZT  
Opal Tinuin® 1600  
Opal Standard BZT

**Surface roughness  $R_A$  [-]: arithmetical mean deviation of roughness profile (ISO 4287:1996)**

Crystal Tinuin® 1600  
Crystal Standard BZT  
Opal Tinuin® 1600  
Opal Standard BZT

**Recommended additives for the building & construction industry**

BENEFIT	Pipes	Geomembrane, geosynthetic	WPC	Roofing	Siding	Rotomolding	Glazing	PVC	Photovoltaic panels
<b>Solutions for processing and thermal stability</b>	Irganox® Irgafos® Irganox® B Irganox® 1330 IrgaCycle®			Irganox® Irgafos® Irganox® B		Irganox® Irgafos® Irganox® B Irgastab® RM	Irganox® B 900	Irganox® Irgafos® Irganox® B	Irganox® Irganox® B
<b>Versatile light stabilizers for various applications</b>	Chimassorb® 119 Chimassorb® 944 Chimassorb® 2020 Tinuvin® 622			Chimassorb® 2020 Tinuvin® XT 850 Tinuvin® 770 Uvinul® 5050	Irgastab® IS 2520 (Improved productivity and very long lifetime)  EB 2540 (Improved productivity and exceptionally long lifetime)	Tinuvin® 360 Tinuvin® 1400 Tinuvin® 1577  Uvinul® 3030 (for optimized color)	Chimassorb® 81	Tinuvin® XT 835 (Check availability with BASF representative)	Premium light stabilizer blends with exceptionally long lifetime and excellent sustainability

# / Terminology

<b>ABS</b>	Acrylonitrile Butadienestyrene	<b>PET</b>	Polyethylene Terephthalate
<b>EBA</b>	Ethylene Butyl Acrylate	<b>PMMA</b>	Polymethylmethacrylate
<b>EVA</b>	Ethylene-Vinyl Acetate	<b>PO</b>	Polyolefin
<b>HDPE</b>	High-Density Polyethylene	<b>POM</b>	Polyoxymethylene
<b>HIPS</b>	High-Impact Polystyrene	<b>PP</b>	Polypropylene
<b>LDPE</b>	Low-Density Polyethylene	<b>PS</b>	Polystyrene
<b>LLDPE</b>	Linear Low-Density Polyethylene	<b>PS</b>	Process Stabilizer
<b>LS</b>	Light Stabilizer	<b>PU</b>	Polyurethane
<b>LTTS</b>	Long-Term Thermal Stabilizer	<b>PVB</b>	Polyvinylbutyral
<b>PA</b>	Polyamide	<b>PVC</b>	Polyvinyl Chloride
<b>PBT</b>	Polybutylene Terephthalate	<b>TPO</b>	Thermoplastic Polyolefin
<b>PC</b>	Polycarbonate	<b>TPU</b>	Thermoplastic Polyurethane
<b>PE</b>	Polyethylene	<b>UVA</b>	UV Absorber
<b>PES</b>	Polyester		



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