



GRAFT POLYMER
COMBINE INCOMPATIBLE

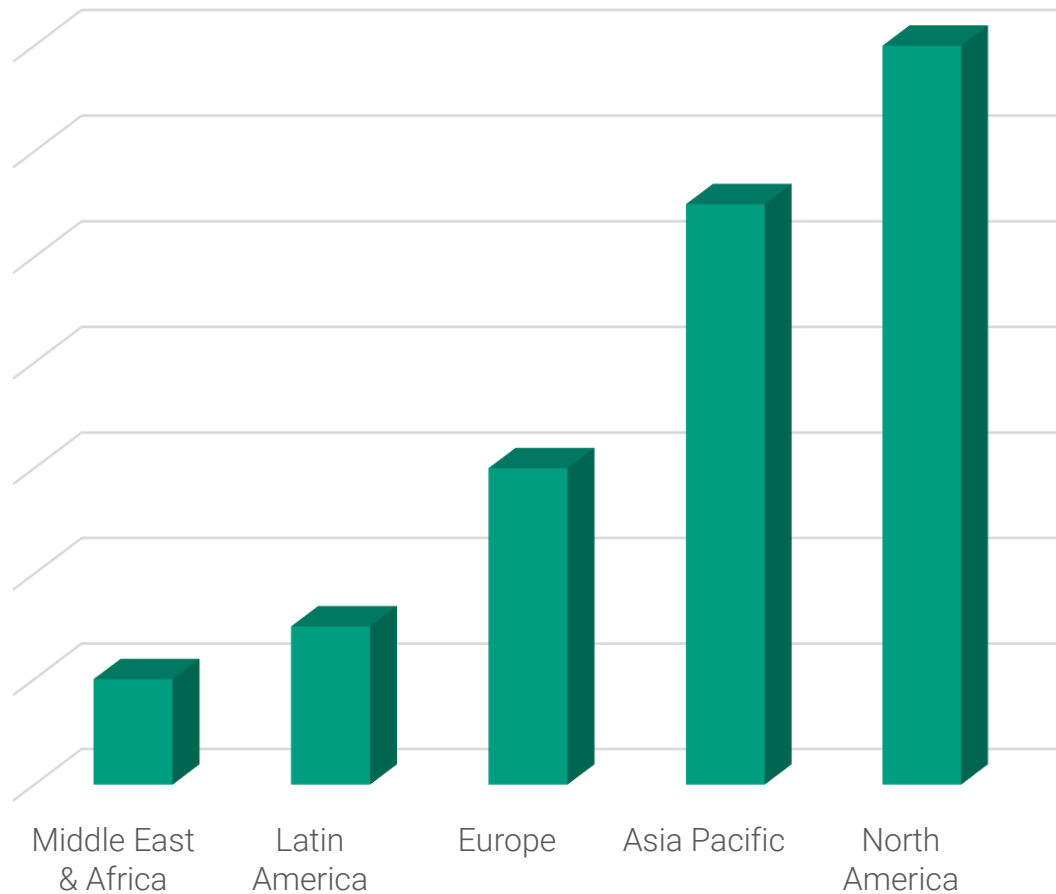
GRAFTASYNT® BMI

**Elevate Your Possibilities with GRAFTASYNT® BMI –
Where Innovation Meets Excellence in High-Performance Resins!**

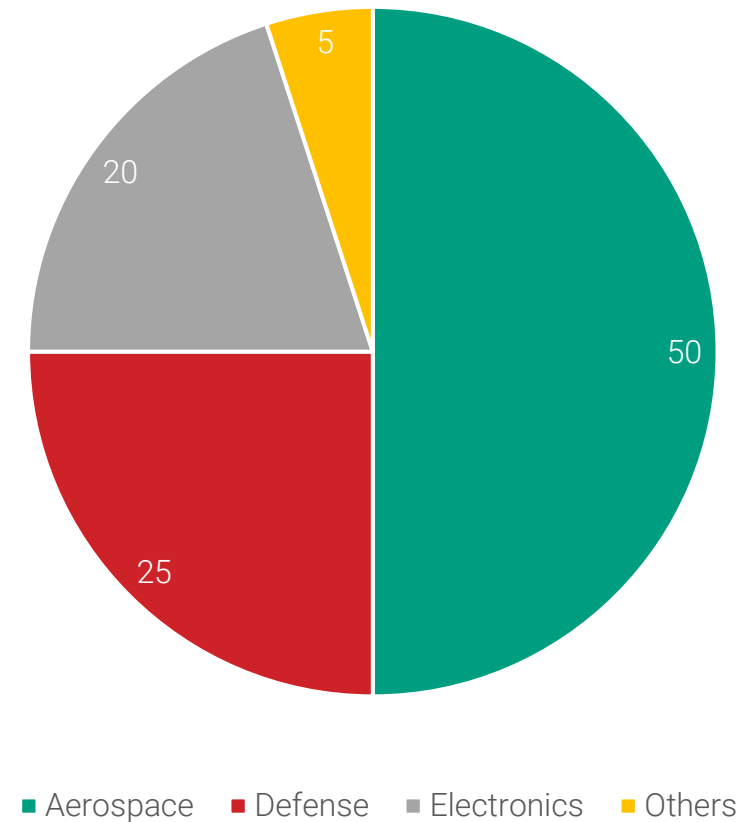
BISMALEIMIDE MARKET FORECAST TO 2031

The Bismaleimide Market is expected to grow from USD 256.40 Million in 2022 to USD 271.10 Million by 2031, at a CAGR of 0.80% during the forecast period.

BMI Market by Region, 2022



End Use of BMI



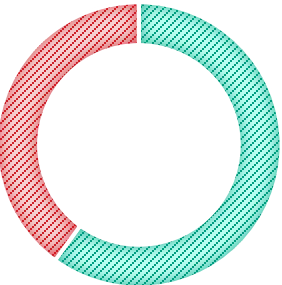
BISMALEIMIDE KEY MARKET FINDINGS

Proprietary Thermosetting Bismaleimide Resins Help in Production of High-Performance Composites

BMI Adhesives are in Demand for Manufacturing Flexible Printed Electronic Circuit Boards

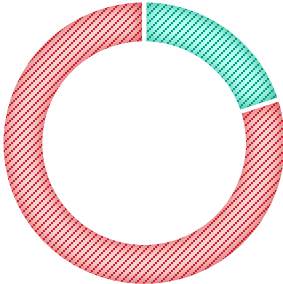
COMPOSITES

■ BMI in Composites



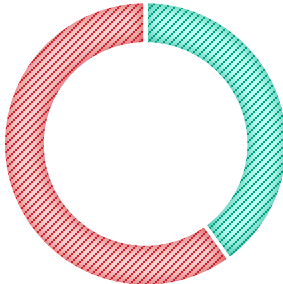
ADHESIVES

■ BMI in Adhesives



OTHERS

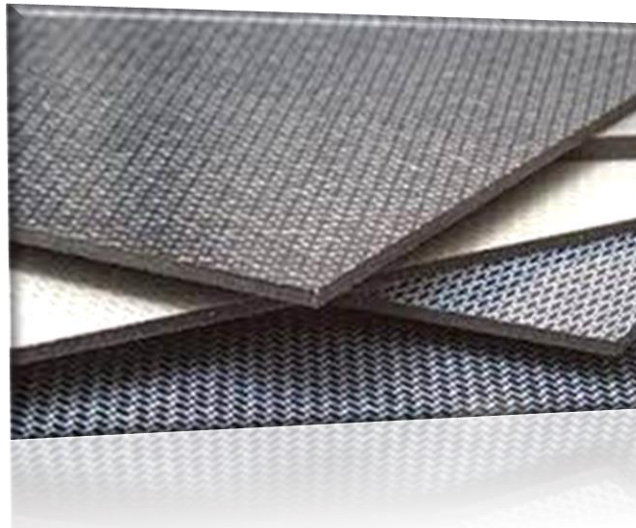
■ BMI in Other applications



2.7%
CAGR (2021-2031)
Market Value 2031
US\$ 80.7 Mn

BISMALEIMIDE MAIN APPLICATIONS

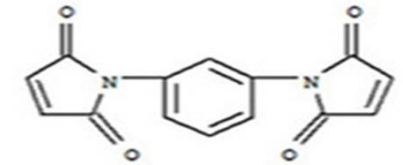
- ❖ High Performance Resin in Reinforced Composites (Space, Avia, Military)
- ❖ High Performance Adhesives
- ❖ Crosslinking Agent for Thermo-Reversible/Self-Healing applications
- ❖ Vitrimers (Diels-Alder reaction pair)



The Advantages of BISMALEIMIDE (BMI)

BISMALEIMIDE (BMI) represents a novel polymer class originating from the defense industry, boasting a unique set of attributes:

- Exceptional **heat resistance**, even under high temperatures and humid conditions.
 - Consistently **reliable electrical performance** across a wide temperature range.
 - Inherent **non-flammability**.
 - Outstanding **ease of processing**.
 - A remarkable **balance of thermal, mechanical, and electrical properties** makes it a favored material for composites and electronics.
-
- BMI-based composites are deployed in the most demanding applications, spanning from the U.S. Air Force's Raptor F-22 to Formula-1 cars.
 - BMI matrix composites maintain **exceptional mechanical properties** within the temperature range of 177°C (350°F) to 230-290°C (450-550°F).
 - BMI resins **readily integrate with standard composite technologies**, such as resin transfer molding (RTM).
 - BMI resin achieves **exceptional thermal and mechanical properties** and maintains processability through the innovative THERMOREVERSIVE mechanism.



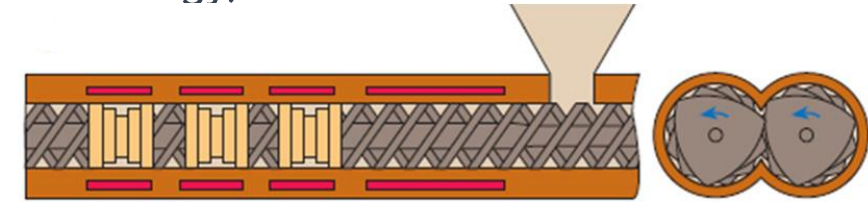
Maleimides are heterocyclic compounds containing N in the main chain and a highly active double bond



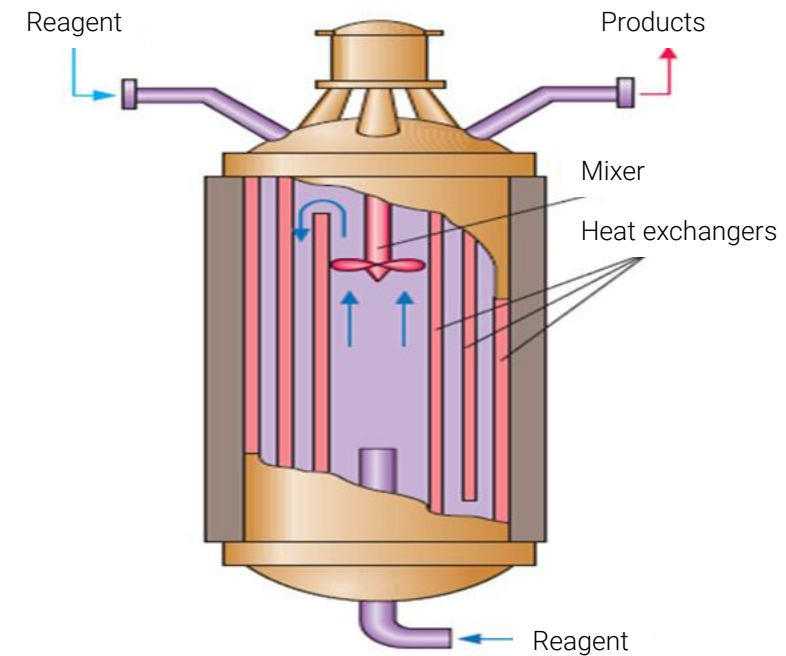
Revolutionary Bismaleimide (BMI) Synthesis Technology

The Graft Polymer company proudly introduces an innovative BMI synthesis technology, characterized by numerous compelling advantages:

- ✓ Utilization of our proprietary, cost-effective solid-supported catalytic acid systems.
- ✓ Gentle synthesis conditions, operating at temperatures of up to 150°C.
- ✓ Effortless removal of the solid catalyst from the polymer solution, streamlining the extraction process.
- ✓ Catalyst reuse, up to 10 cycles, without compromising the synthesis product's crucial properties.
- ✓ Streamlined extraction procedures, encompassing material precipitation, solvent recovery, and recycling.
- ✓ Rapid synthesis, ensuring efficient production.
- ✓ High product purity, yielding BMI products with a minimum purity level of 95-97%.
- ✓ Versatile application of the resultant BMI product in diverse polymer alloys, including epoxy, polyurethane, polyacrylates, polyesters, and more.
- ✓ Remarkable cost reduction in BMI synthesis, achieving a substantial order of magnitude reduction compared to conventional methods.
- ✓ Broader utilization of BMI and its alloys across a spectrum of industries previously hindered by the prohibitive costs of standard BMI technologies.



Preparing a Solid Catalyst Mix



Reactor Synthesis BMI

ADHESIVES AND ADHESIVE FILMS BASED ON GRAFTASYNT® BMI

Bismaleimides are typically employed alongside reactive monomers (e.g., vinyl and allyl compounds, allyl phenols, aromatic amines, etc.).

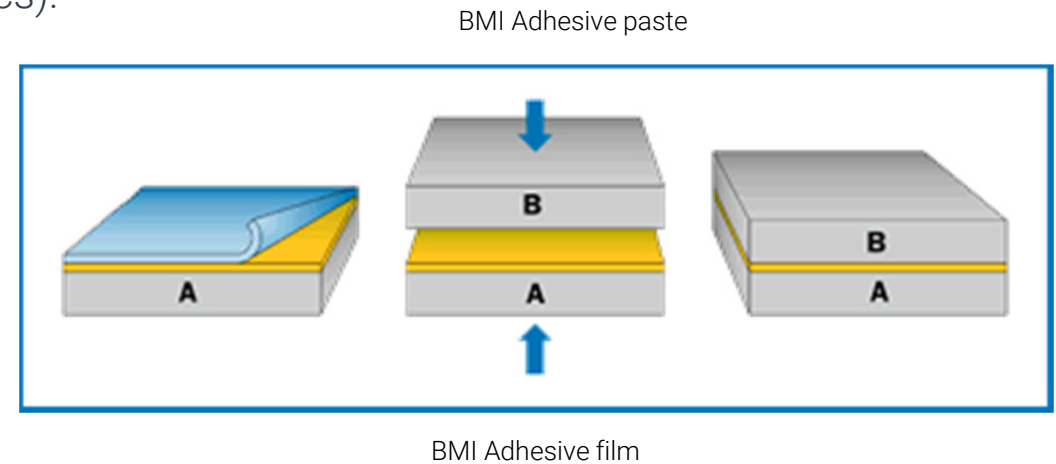
The primary advantage of this combination is the enhancement of processability.

Viscosity reduction often involves the use of various solvents and plasticizers. Typical applications encompass BMI matrices for fiber composite materials within the aviation and aerospace sectors.

BMI adhesives, available in paste form, are designed for high-temperature-resistant applications on diverse substrates (aluminum, stainless steel, glass, ceramics, and select plastics).

These adhesives offer:

- ✓ *Exceptional high-temperature resistance*
- ✓ *Outstanding solvent resistance*
- ✓ *Remarkable hydrolysis resistance*
- ✓ *Superior adhesive strength*



BMI adhesive films feature a polyester base with a dry bismaleimide layer for specialized applications.

MAIN ADVANTAGES OF GRAFT POLYMER TECHNOLOGY IN GRAFTASYNT BMI

- Commitment to environmental cleanliness and production safety
- Profound theoretical and practical expertise in the process
- Precisely controlled levels of modification
- Nano-scale and volume adjustments (3D modifications)
- Stability of functional groups and irreversibility of modification



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