

# Composite Manufacturing



## EVONIK

We are a global player with presence in local markets; proven, reliable product quality and supply security – on time and on target.

## FACE-TO-FACE PERFORMANCE

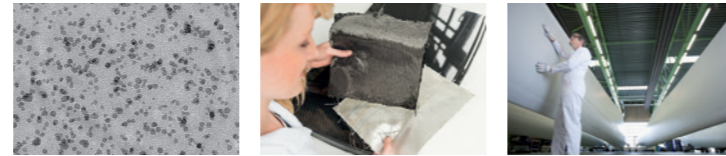
- We have broad chemical platforms including amines, amides, nanosilicas, tougheners and thermoset resins.
- We are experts for thermosetting polymers – the matrix resins as well as the crosslinkers.
- We have specialized test facilities and laboratories in North America, Europe and Asia.
- You can count on our specialists for process knowledge, physicochemical expertise, scientific studies and regulatory knowledge.
- Long-term relationships built on trust is the basis of our work.

## OUR COMPETENCE

- We offer a broad portfolio of modified resins and reactive resin modifiers as well as formulated amine curing agents for tailored epoxy composite solutions.
- We are specialists with a profound knowledge and experience in composite related epoxy matrix systems and application processes.
- We provide strong technical support with a global footprint.

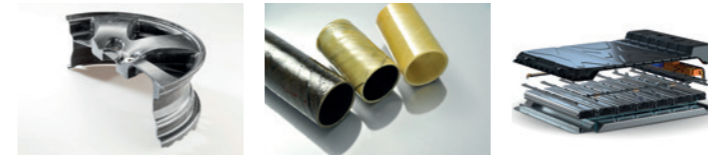
## REACTIVE RESIN MODIFIERS

NANOPOX® products are epoxy resins containing 40 wt% of spherical silica nanoparticles. Strength, modulus, compressive strength and especially fatigue performance is improved significantly. ALBIDUR® and ALBIPOX® products are 40 wt% concentrates of elastomers in epoxy resins. They are based on core shell or rubber tougheners and are used to formulate high performance resins.



## EPOXY CURING AGENTS

Ancamide®, Ancamine® and Amicure® curing agents offer a versatile toolbox allowing developers and manufacturers of fiber reinforced epoxy composites to cope with a broad range of material and process requirements.



## SUSTAINABILITY

Sustainability of composites is an aspect that mostly relates to the advantages they offer over conventional materials during their use phase. Besides a long service life and low maintenance requirements this particularly comprises their high material performance at very light weight contributing to lower energy consumption and thus reducing CO<sub>2</sub> emissions during a product's life.

However, to fully utilize the benefits of composites it is crucial to consider their whole life cycle starting with the footprint of the raw materials, through the production processes and use phase to recycling and disposal. To address these aspects Evonik is continuously driving innovation forward supporting our customers with solutions that help to reduce their global warming potential and to cope with current and future challenges of sustainability and environmental protection.

## THE NEW VESTA ECO SERIES

The most recent solution in this field is VESTAMIN® IPD eCO, a cycloaliphatic diamine, utilizing a mass balance approach on basis of ISCC PLUS certified renewable raw materials with the benefit of a significantly smaller carbon footprint.



## MANUFACTURING METHODS FOR FIBER-REINFORCED COMPOSITES

### VACUUM ASSISTED INFUSION (VARI), REACTIVE TRANSFER MOLDING (RTM)

CARBON OR GLASS FIBER-REINFORCED	RESIN	HARDENER
VARI	NANOPOX® F 400, F 520; 30-100 wt%	Ancamine® 2919*
RTM, standard	ALBIPOX® F 081; 50-100 wt%	Ancamine® 1769
RTM, high T <sub>g</sub>	NANOPOX® F 400, F 700; 30-100 wt%	Ancamine® 2167
RTM, toughened	ALBIDUR® EP 2240A; 10-15 wt%	Amine Hardener 598*

### FILAMENT WINDING

	RESIN	HARDENER
High toughness	ALBIDUR® F 061	Ancamine® 2919*
Standard	ALBIPOX® F 081	Amicure® 101

\*developmental product \*\*with injection box

### PREPREGS, SHEET MOLDING COMPOUND (SMC)

CARBON OR GLASS FIBER-REINFORCED	RESIN	HARDENER
140 °C cure	NANOPOX® F 400, F 700; 30-100 wt%	Amicure® CG-1400F, CG-1200F, VESTALITE® S 101
High T <sub>g</sub>	NANOPOX® F 400, F 700; 30-100 wt%	VESTALITE® S103

### PULTRUSION

	RESIN	HARDENER
High toughness	ALBIDUR® EP 2240A; 10-15 wt%	Ancamine® XR29RB*
Tough and outstanding fatigue performance	ALBIPOX® F 081; 50-100 wt%	Ancamine® XR29RB*
Standard, stiff and strong	NANOPOX® F 400; 30-100 wt%	Ancamine® R215**, XR29RB*

## MODIFIED EPOXY RESINS

ALBIPOX® F 081 and ALBIDUR® F 061 are ready-to-use epoxy resins, which can be cured with all commercial hardeners. They can be blended with standard epoxy resins to obtain the perfect balance between viscosity, performance and cost.

## AMINE-BASED CURING AGENTS

VESTALITE® S amine-based curing agents are designed for high performance epoxy SMC applications offering an excellent balance of low viscosity, good processability and short curing times as well as high mechanical properties and temperature stability complemented by a very low emission profile.

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**Our product portfolio:**

Amicure®  
Ancamine®  
VESTALITE®  
VESTAMIN®

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**Our product portfolio:**

ALBIDUR®  
ALBIPOX®  
NANOPOX®

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