COATINGS

RAVEMUL T37

Unique Veova-based, APEO free polymer designed for intumescent & fire-resistant paints

High chemical resistance of the vinyl acetate/vinyl esters terpolymer

Water and alkali-resistant

Resistance to weathering

High storage & ageing stability

Solutions for Enhanced Fire-Resistant Intumescent Coatings for Modern Construction

VINAVIL®

UNDERSTANDING INTUMESCENCE

WHAT ARE INTUMESCENT MATERIALS?

The intumescent materials are the **substances that undergo a significant expansion when exposed to heat or fire, forming an insulating barrier that protects underlying materials from high temperatures.**

These materials are primarily used in fire protection applications to enhance the fire resistance of structures, components, or systems by slowing the spread of fire and maintaining structural integrity.

HOW DO THE INTUMESCENT PAINTS WORK?

The intumescent paints are specially formulated to act as a passive fire protection barrier. Just like other intumescent materials, **these paints kickstart a chemical reaction that leads to a rapid expansion of their coating,** forming a thick, insulating char layer that protects the underlying structure from fire. This process occurs in distinct stages, each activated at a progressively higher temperatures.

THE STAGES OF REACTION

≈ 250°C Acid Donor Activation

At approximately 250°C, the acid donor in the intumescent paint initiates the reaction by releasing polyphosphoric acid. This acid plays a foundational role in creating a stable char layer, which begins to form on the surface of the fundamental coating.

$$(NH_4PO_3) \xrightarrow[-n\ NH_3]{>250°C} (HPO_3)_n$$

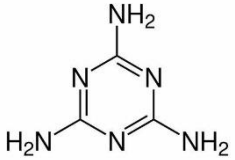
≈ 300°C Carbon Source Carbonization

As temperatures reach around 300°C, the carbon source begins to carbonize. This process generates a carbon matrix by forming polyphosphoric acid esters, which decompose into a foaming structure. This carbon matrix becomes the base of the expanding char layer, providing additional insulation.

$$(HPO_3)_n + C_x(H_2O)_m \longrightarrow [\,-C-\,]_x + (HPO_3)_n * m\ H_2O$$

≈ 400°C Blowing Agent Activation

At approximately 400°C, the blowing agent begins to decompose, releasing gases (primarily nitrogen and water vapor). These gases cause the char layer to expand, creating a foamy, thick barrier that adheres to the substrate. This expanded char layer provides critical thermal insulation by slowing down the heat transfer to the underlying structure.



$$\longrightarrow NH_3O_2 \xrightarrow{O_2} N_2 + H_2O$$

FIRE RESISTANCE AND REI CLASSES SIMPLIFIED

WHAT ARE INTUMESCENT MATERIALS?

The intumescent paints can make a difference in areas requiring compliance with strict fire safety codes, where fire protection is crucial. They can provide an **extra passive fire protective layer** by extending how long a building's structural elements can withstand exposure to fire. This length of time is measured using REI ratings.

REI Rating

•**R (Resistance)**: The structure's stability under fire.
•**E (Airtightness)**: Its ability to prevent flames, smoke, and hot gases from passing through.
•**I (Insulation)**: Its capacity to limit heat transfer to the unexposed side.

Each REI class includes a time rating in minutes (e.g., REI 120), indicating how long the element should perform under fire. Fire resistance times are based on the rating of REI under the standard EN 13501. The most common ones include: 15, 30, 60 up to 360 minutes.

The intumescent paints protect structures like reinforced concrete, meeting standards such as EN 13381-3 for load-bearing structures and UNI EN 1363-1 for non-load-bearing walls. Testing for fire resistance considers elements like floors, walls, or beams and follows ISO 834 standards or custom requirements.

WHERE CAN THE INTUMESCENT PAINTS PROVIDE KEY SUPPORT?

High-Rise Buildings: Applying the intumescent paints to structural steel can help prevent it from reaching the critical temperatures, in case of a fire, and maintain the structural stability by providing valuable time for evacuation.

Commercial and Industrial Facilities: Warehouses, factories, and plants often store flammable materials, making fire protection essential. Using intumescent paints aids in protecting the building structure and extending the evacuation time.

SOME PRACTICAL EXAMPLES

- **Stadiums and Arenas:** These areas gather large numbers of people and require enhanced fire protection on structural steel elements to prevent their collapse during a fire.
- **Transportation Hubs:** Any area with a lot of people and vehicles has a higher potential for fires. The usage of intumescent paints on any steel beams and structural supports adds an extra layer of protection to already existing measures.
- **Hospitals & Educational Institutions:** With a high occupancy and vulnerable populations, applying the intumescent paints to these structures ensures they remain intact long enough for a safe evacuation.
- **Marine & Offshore Structures:** Oil platforms, ships, and offshore structures work with flammable materials, considered to be fire hazards, due to the presence of flammable materials, and intumescent paints can provide critical fire resistance to the structural framework.
- **Tunnels and Underground Structures:** In confined spaces like tunnels, evacuation can be challenging, and intumescent paints add a crucial layer of fire protection to prevent catastrophic structural failure.

RAVEMUL T37

A UNIQUE VEOVA-BASED POLYMER SPECIFICALLY DESIGNED FOR INTUMESCENT AND FIRE-RETARDANT PAINTS.

RAVEMUL T37 is a **terpolymer water-based dispersion of vinyl acetate and vinyl esters** which contains no alkylphenol ethoxylate (APEO-free). Its high alkali and chemical resistance makes it ideal for formulating the intumescent paints, while it also provides excellent storage stability, water, and weathering resistance.

KEY CHARACTERISTICS

CHARACTERISTICS	UNIT	RAVEMUL T37
Solid content	%	50±1
Brookfield Viscosity RVT at 20rpm, 23°C	mPas	1000±500
pH		4.5±0.5
Tg	°C	35
Emulsifying system		Cellulose derivatives
MFFT	°C	3
Particles size distribution	µm	0.4 ÷ 1.2

KEY FEATURES

High Hydrophobicity

High hydrophobicity ensures that the paint forms a water-resistant barrier for intumescent paints, which is crucial for protective coatings used in fire-retardant applications.

High Alkali Resistance

Alkali resistance ensures that the paint can withstand high pH environments, typically found in concrete or other alkaline surfaces.

High Weathering Resistance

RAVEMUL T37 ensures the longevity and sustained effectiveness of the paint, making it ideal for outdoor applications where constant exposure to weather elements is inevitable.

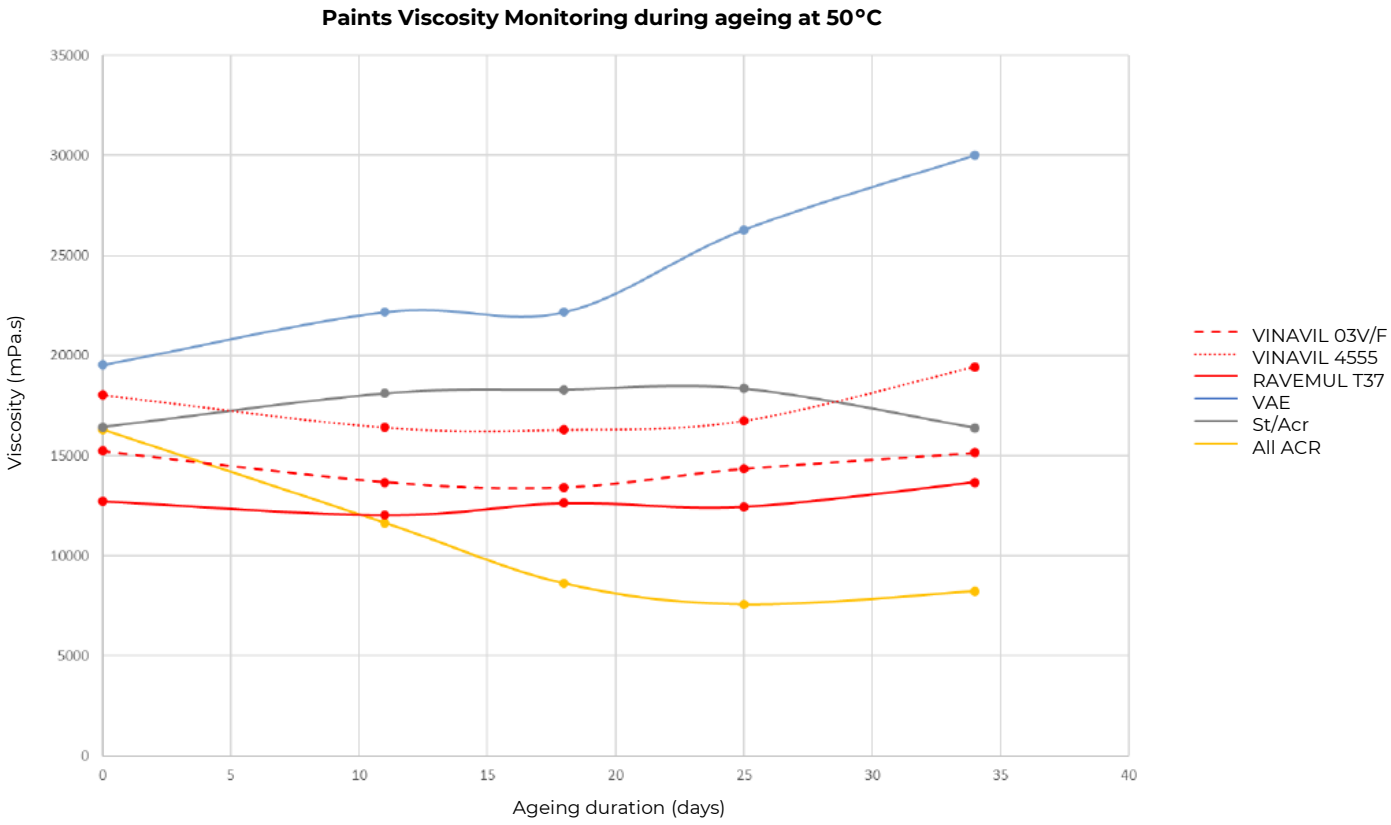
High Storage Stability

High storage stability is essential for manufacturers and end-users as it ensures that the paint remains usable over extended periods, without separation, drying out, or other forms of degradation.

WATER-BASED INTUMESCENT PAINT FORMULATION
FORMULATED WITH RAVEMUL T37

COMPONENTS	W. %	FUNCTION
Water	26.00	
Dispersing Agent	0.10 – 0.3	
Anti-settling agent	0.10 – 0.3	
Biocide	0.03	
TiO_2	9.00	Pigment
Pentaerythritol	3.00 – 3.50	Carbon Source
Melamine	9.00 – 10.00	Blowing agent
APP (ammonium polyphosphate)	25.00 – 27.00	Flame retardant
RAVEMUL T37	24.00 – 26.00	Binder - Vinavil
Coalescing agent	1.00	
Total	**100.00**	

IN-CAN STABILITY DURING AGEING PROCESS



The intumescent paint based on RAVEMUL T37 has better in-can stability than other market alternatives.

REACTIONS TO FIRE

VINYL VEOVA POLYMERS VINAVIL & OTHER TECHNOLOGIES



	RAVEMUL T37	VINAVIL O3V/F	VINAVIL 4555
Time to 500°C	>120 min (473°C)	>120 min (485°C)	>120 min (492°C)
Foam expansion	4.2 cm	1.5 cm	1.5 cm
Expansion factor	42	15	15



	Styrene/Acrylics	VAE	All Acrylic
Time to 500°C	81 min	91 min	61 min
Foam expansion	0.4 cm	0.2 cm	0.3 cm
Expansion factor	4	2	3

PERFORMANCE AFTER EXPOSURE CONDITIONS

VINAVIL EMULSIONS



AFTER AGEING	RAVEMUL T37	VINAVIL O3V/F	VINAVIL 4555
Time to reach 500°C (% of unaged panel)	113 min (94%)	92 min (82%)	61 min (50%)
Expansion factor	30	5	10

RAVEMUL T37 shows high performance after the ageing process, proving it is suitable for intumescent paint formulations intended for internal and semi-exposed conditions.

EXPOSURE CONDITIONS

TYPE	EXPOSURE CONDITIONS	
X	For all conditions (internal, semi exposed & exposed)	
Y	**For internal & semi-exposed conditions** (T<0°C , no rain, limited UV)	
Z1	For internal conditions (T>0°C) with high humidity	
Z2	For internal conditions (T>0°C) with high humidity other than Z1	

EU EAD 350402-00-1106:

Fire testing after accelerated aging
Type Y cut-off limit: at least 85% of fire performance of unaged coating
Y conditions: 7 days aging program repeated 2 times (14 days program)

Note: All the tests on the intumescent paints were done in collaboration with Hexion.

In conclusion...

RAVEMUL T37 is a high-performance terpolymer ideal for the intumescent paints, offering excellent hydrophobicity, alkali resistance, and weathering durability. Its versatile properties ensure long-lasting protection in demanding environments, making it a reliable choice for fireproof coatings and outdoor applications.

Vinyl Veova polymers VINAVIL exhibit exceptional fire resistance, demonstrated by their longer time to reach critical temperatures and a significantly higher foam expansion factor. RAVEMUL T37 stands out by offering excellent storage stability and durability, making it suitable for both internal and semi-exposed conditions.

Want more information?

Get in touch

VINAVIL®