VERTEC Polyester Catalyst technology for PET fibre

Advanced titanium technology

Johnson Matthey Catalysts has developed a catalyst technology for use in the manufacture of PET fibre products. The technology, based on novel organic titanium chemistry is applicable in both the direct esterification (DE) and polycondensation (PC) reaction stages. Product quality, environmental benefits and significant rate enhancement over conventional antimony catalysts have been demonstrated on commercial plants.

Safe and easy handling

Our catalysts are supplied as clear, non-toxic liquids that are miscible with ethylene glycol. They are easy to store, handle and introduce to the reactor system.

Clean and consistent

Polymer properties

The exceptional activity of our catalysts results in much lower addition levels than for antimony catalysts. This produces a polymer of exceptionally low particulates, excellent clarity, reduced greying and increased brightness.

Fibre quality

The low level of particulates in polymer made using **VERTEC** catalyst technology gives highly consistent fibre with fewer breaks during spinning and texturizing.

Reaction rate

VERTEC catalyst technology has demonstrated an increase in plant throughput of up to 15% in commercial production processes.

Environmental issues

Our titanium-based catalysts have low environmental impact. Antimony can be partly or completely eliminated from the process to the benefit of operators and waste management.

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Comparative data - polymerization and chip

Comparison of polyester properties from commercial batch trials with **VERTEC** catalyst technology and antimony oxide. (PTA based process).

	VERTEC	Antimony
Catalyst (ppm metal)	9	270
DE time at 260°C (mins)	160	185
PC time at 295°C (mins)	150	175
Relative viscosity	1.63	1.63
COOH (meq/g)	25	28
DEG (wt %)	1.0	1.1
L	77	75
a*	-2.5	-1.0
b*	0-5	0-5

The higher activity of the **VERTEC** catalysts gives shorter DE and PC times offering the potential to eliminate bottlenecks, reduce costs and increase plant output where this is required.

Consistency of fibre

VERTEC catalyst technology increases fibre consistency by:

- Eliminating antimony particulates in threadlines.
- Eliminating antimony deposits in spinnerettes.
- Reducing breaks during spinning and texturizing.

Comparative data - fibre properties

VERTEC catalysts are liquids which are hydrolytically stable and soluble in ethylene glycol allowing easy and flexible addition to the process.

Representative data from commercial spinning trials with **VERTEC** catalyst-based polyester compared to standard POY data.

	VERTEC	Antimony
Speed (m/min)	3300	3300
Breaks per ton	0.1	0.3
Undrawn yarn relative viscosity	1.59	1.60
Uster average (%)	1.0	1.0
Tenacity (cN)	603.9	603.9
Elongation (%)	125	125

Representative data from commercial texturing trials with **VERTEC** polyester compared to standard DTY data. (dtex 272 f 32).

	VERTEC	Antimony
Machine type	FK 12	FK 12
Breaks per ton (br/t)	16	20
Lessona	10.37	10.58
TS 160	4.0	4.3
Tenacity (g/dtex)	3.7	3.7
Extension average (%)	33	32
Dye affinity (1-low; 9-high)	10	9

For further information on the performance of polyester catalysts in PET fibre please do not hesitate to contact us at the address below.

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Johnson Matthey Catalysts - dedicated to customer service

Tailoring optimum performance

Designing the application is an integral part of the technology package. Johnson Matthey Catalysts engineers with experience of polyester processes will make an appraisal of your plant – the configuration, temperatures, pressures and other conditions. They will then work out how and where the catalyst is introduced, to deliver the optimum process efficiency.

The catalyst itself will also be fine-tuned to the process and to meet your specifications for end product. We have gained a fundamental understanding of the relationship between catalyst design and polymer properties.

Working with Johnson Matthey Catalysts

The chemistry and engineering components of our technology will only be appropriate to your needs if the third element is right – service. A fruitful working relationship with us begins with a confidential review to establish your marketing goals and technical targets. Having agreed terms of business, based on gains yielded by the technology, we can proceed on a genuine partnership basis.

When a detailed appraisal of your process is complete, we use our extensive catalyst experience to arrive at an individual solution.

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Trial and commissioning

Once we have defined the correct formulation and conditions, these are screened in our laboratories. Selected technologies then proceed to our semi-technical facility where we have the capability to evaluate catalyst performance using a variety of analytical techniques.

At the trial stage of plant-scale manufacturing, spinning or bottle-blowing, our specialists will work side-by-side with yours to optimize the catalyst technology. We will return to fully implement the technology and see you successfully through the initial period of operation.

Analytical facilities

We have a batch autoclave capable of producing PET from terephthalic acid and ethylene glycol, and a full suite of analytical facilities which include:

- Molecular weight determination (GPC and intrinsic viscosity).
- Polymer analysis; carboxyl end groups, DEG and IPA content, acetaldehyde, cyclic oligomers.
- Thermal behaviour of polymers by DSC.
- Low level element detection on the ppm scale utilizing ICP-OES.
- Melt rheology and rheological behaviour.
- Evaluation of the SSP process.
- % crystallinity determination by density column measurement.
- Rapid catalyst screening.

Environmental Information

VERTEC catalysts for polyester can reduce the amount of energy needed to complete polymerisation, hence reducing the environmental burden. These catalysts are based on titanium, which is widely regarded as being environmentally benign.

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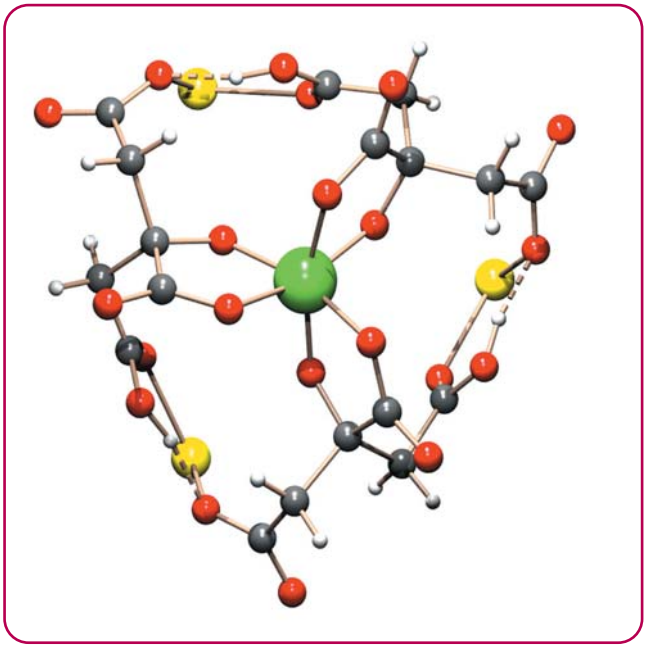
VERTEC Polyester Catalysts

Titanium has arrived

VERTEC catalyst technology for polyester is based on organic titanium chemistry.

The polyester catalyst team at Johnson Matthey has used its many years of experience in titanium chemistry to develop new molecules that overcome the traditional drawbacks of titanium, allowing its many benefits to be exploited for the first time without compromising product quality. These new catalysts are highly selective, stable to hydrolysis and extremely active compared to antimony and germanium based products. They are non-toxic liquids, stable in glycol solutions making them easy to handle.



Clarity

The high activity of the **VERTEC** technology results in the need for very low catalyst concentration enabling the manufacture of polymers that have exceptional clarity. A colour management system is used to give neutral coloured polymers that are brighter than those typically found in the market place. For manufacturers of polyester film and bottle resin, the enhanced clarity and brightness are of particular benefit.

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Quality

Catalyst residues frequently result when using antimony catalysts. In contrast, the low concentration of the **VERTEC** catalysts reduces the metal content of the polymer by up to 90%, giving higher tensile strength and lower risk of breakage during high speed spinning of film or fibre.

Throughput

Titanium catalysts have always shown greater activity than antimony, but the new **VERTEC** catalyst technology is faster still. Already in commercial use in batch and continuous production processes, it has demonstrated an improvement of more than 15% in plant throughput.

Environmental impact

Titanium is well known as a benign metal, added to many foodstuffs in the form of the oxide. **VERTEC** catalysts therefore, are of low environmental impact and satisfy the increasing demand for antimony-free fibre, film and resin.

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