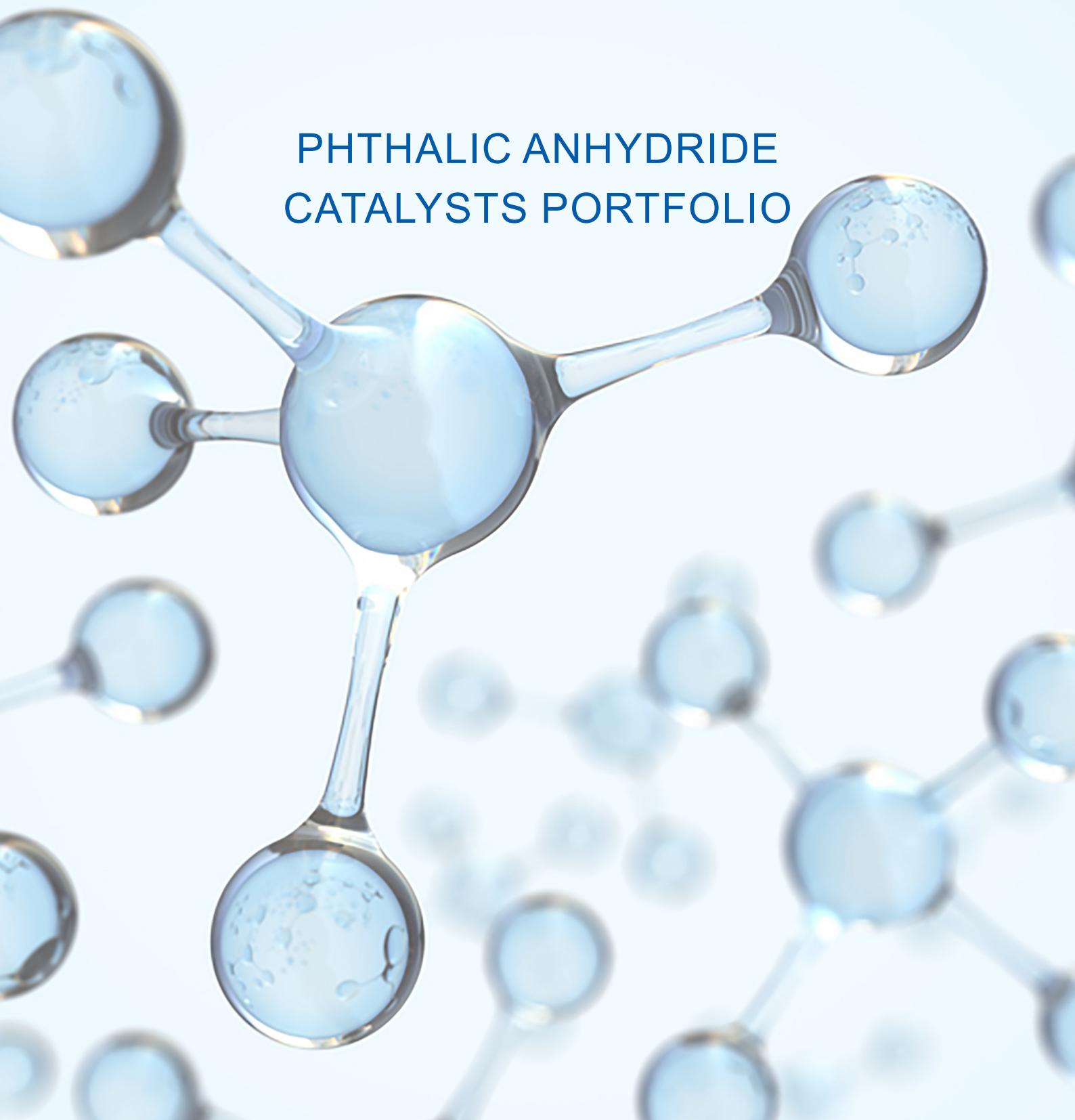




PHTHALIC ANHYDRIDE CATALYSTS PORTFOLIO





PHTHALIC ANHYDRIDE CATALYSTS PORTFOLIO

Production Sites



Polynt S.p.A. - Italy (Scanzorosciate)

Polynt Group

After the merger with Reichhold on May 2017 the new Polynt Group is a global Company in the Intermediates, Coating and Composite Resins, Thermoset Compounds, Gel-coats and niche Specialties.

This combination enhances the Group's leading position as a global vertically integrated specialty chemicals player, with significant global presence in Europe, North America and Asia, a strategy initiated by Polynt with the successful integration of PCCR and CCP in the last years and now further reinforced by Reichhold's global scale, extensive product portfolio and R&D competencies.

Polynt Group is known for its superior quality and impressive range of products and with its excellent distribution network it can provide first-class service to customers whatever their market. Customer Service and Technical Service teams are renowned for their customer focus, offering the best service even after products have left manufacturing.

The Group strives to keep customers satisfied, assisting them in producing premium quality products every time they use its products. Product innovation is important for the Group's business and it is the reason for which it constantly works with customers to find solutions to problems.

Introducing new or improved products ensures that Polynt Group continue not only to deliver what the market wants and needs, but also when it is wanted and needed.



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POLYNT CATALYSTS: Innovation and Quality

Our experience is the guarantee.
Our success is proof.
Our commitment is the future.

PEOPLE ORIENTED CHEMICAL INDUSTRY

Polynt is a leader in the production of Composites, Intermediates, and Coatings. We provide a wide range of products designed for key sectors like agro-food, biomedical, construction, electronics, logistics, and maritime industries.

Through specific production technologies and custom design solutions, Polynt continues to benefit from a growing network of loyal customers. We pay special attention to R&D activities, technology implementation, and process control to meet the increasing demand for safety and quality as required by current markets. Polynt invests in research, innovation, and development to provide advanced, sustainable, and responsible solutions.

Polynt is present in Four Continents with 37 production and commercial sites that contribute to the creation of thousands of items that improve quality of life, while respectfully sustaining the ecosystem balance.

OUR VALUES AND SKILLS

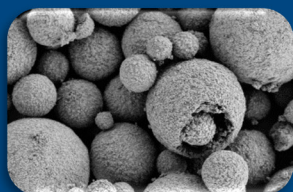


CATALYSTS IN POLYNT

Polynt is a strategic player in the production of selective oxidation catalysts due to our substantial experience and extensive knowledge in the field. Polynt catalysts are mostly used in the production of maleic anhydride from n-butane/benzene and phthalic anhydride from o-xylene. However, Polynt also offers custom and exclusive solutions for our Clients.

Maleic Anhydride from n-butane

Fluid bed



Maleic Anhydride from benzene

Fixed bed



Maleic Anhydride from n-butane

Fixed bed



Phthalic Anhydride from o-xylene



Pyromellitic Dianhydride from durene



Custom Manufactured Catalysts (CMC)



The production site, as well as the Commercial and R&D Departments are located at our headquarters in Scanzorosciate (BG), Italy. At this location, catalysts are manufactured for internal use or sold and distributed globally to our customers. The centralization of all these functions ensures complete control of the process, from bench scale to commercialization.

Thanks to powerful R&D capabilities, partnered with state-of-the-art equipment and efficient production facilities, Polynt offers innovative and strategic catalytic solutions to improve cost effectiveness and the environmental footprint of chemical processes.

R&D Catalyst and Technical Service

Our R&D Catalyst Department and Technical Service Team (TS) make Polynt one of the most competitive and reliable players in the catalyst market worldwide. The unprecedented expertise of our team members ensures comprehensive support from conception throughout the life of the catalyst. Polynt provides top-notch service in terms of customer care and satisfaction.

R&D CATALYST

Over more than 50 years, Polynt has developed a powerful R&D Catalyst Department that continuously strives to offer innovative and sustainable solutions, in accordance with our vision. We are driven to improve catalyst performance and develop new catalyst generations, surpassing customers' expectations.

Outstanding results are achieved by the R&D Department due to the highly educated and expert R&D team and the well-equipped facilities, which include:

- **Technological laboratory** where catalyst preparation (synthesis, shaping and thermal treatment) is conducted. Our team capabilities include:

CATALYST PREPARATION
SYNTHESIS
Reaction
Impregnation
Coating
SHAPING
Granulation
Milling
Tabletting
Spray-drying
THERMAL TREATMENT
Fixed-bed
Fluid-bed

- **Quality Control and Analysis laboratories**, well-equipped with advanced instrumentation which can fully characterize both inorganic and organic substances. Our analytical instrumentation includes:

ANALYTICAL INSTRUMENTATION

BULK PROPERTIES	
X-Ray Diffraction (XRD)	TG-DSC
IR (NIR and FTIR)	UV-Vis
Particle Size Distribution (PaSD)	
CHEMICAL COMPOSITION	
X-Ray Fluorescence (XRF)	ICP-OES & ICP-MS
HPLC & HPLC-MS	GC & GC-MS
S and C content	Ionic Chromatography
SURFACE PROPERTIES	
Nitrogen adsorption	Mercury intrusion
Scanning Electron Microscope (SEM)	Raman Spectroscopy

- Fully automated **Pilot Plant Reactors** that are ready and available for testing catalysts under a wide range of operating conditions.

PILOT PLANT REACTORS

INTERNAL DIAMETER
25 mm
TUBE LENGTH
3,200 mm – 3,700 mm

Our R&D Department collaborates with several external Partners and Universities, which have given us the opportunity to expand our catalyst knowledge and develop innovative catalyst formulations.

TECHNICAL SERVICE (TS)

Before catalyst loading, Polynt provides our Client with the catalyst Operating Manual (OM), containing all the safety information and details necessary to properly load the reactor, start-up the fresh catalyst, and optimize the oxidation yield.

Polynt will send specialists to the Client's location to over-see the steps involved in catalyst replacement and reactor commissioning, which include:

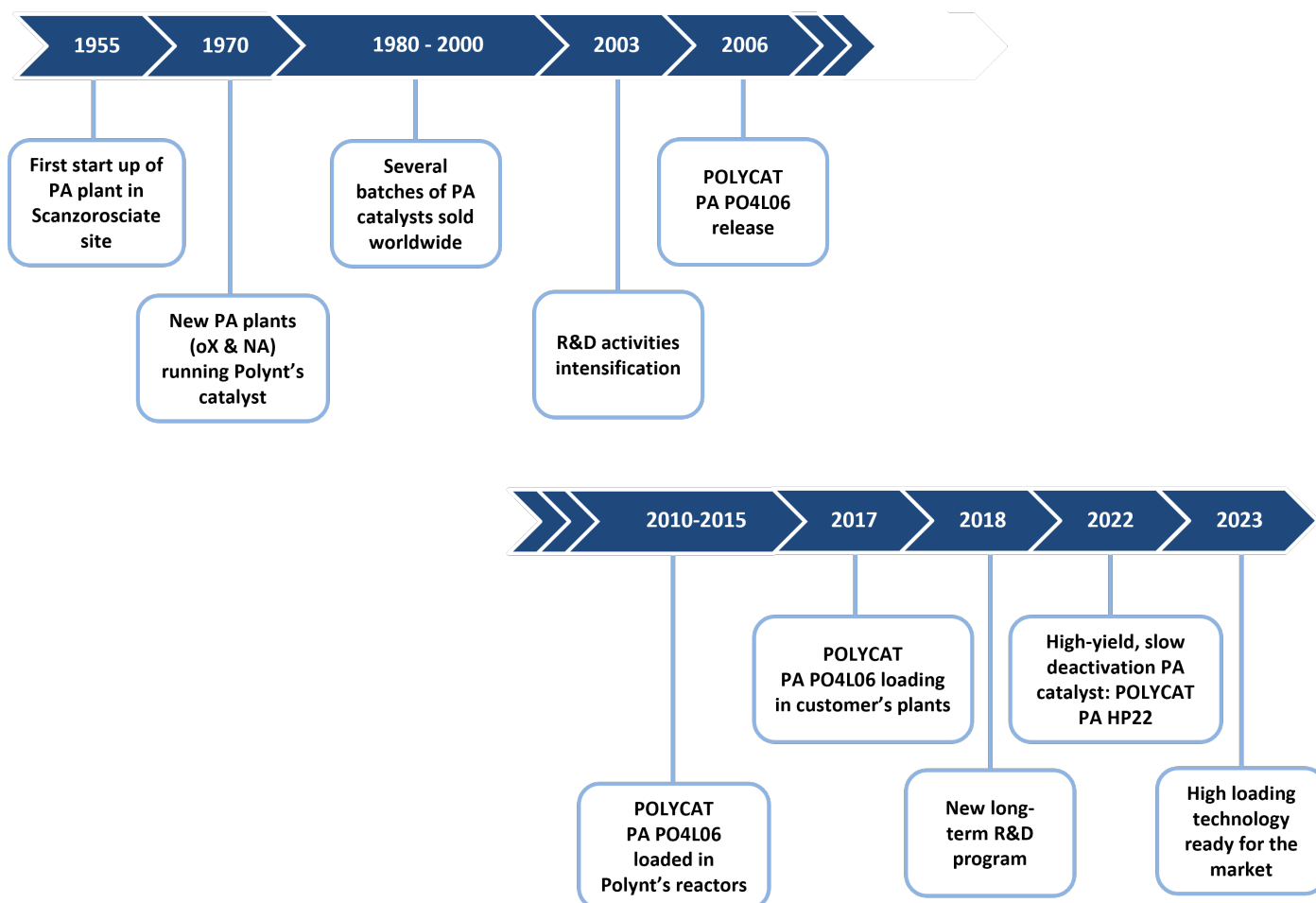
- Reactor inspection prior to catalyst loading
- Spring insertion
- Loading of catalyst and inert
- Reactor and catalyst heating, activation, and ramp-up
- Initial catalyst performance optimization

Throughout the life of the catalyst Polynt will provide our Clients with continuous and reliable Technical Service in order to optimize catalyst operating conditions and performances, ensuring the best customer experience possible.

POLYCAT-PA: Phthalic Anhydride Catalyst

POLYCAT PA HISTORY

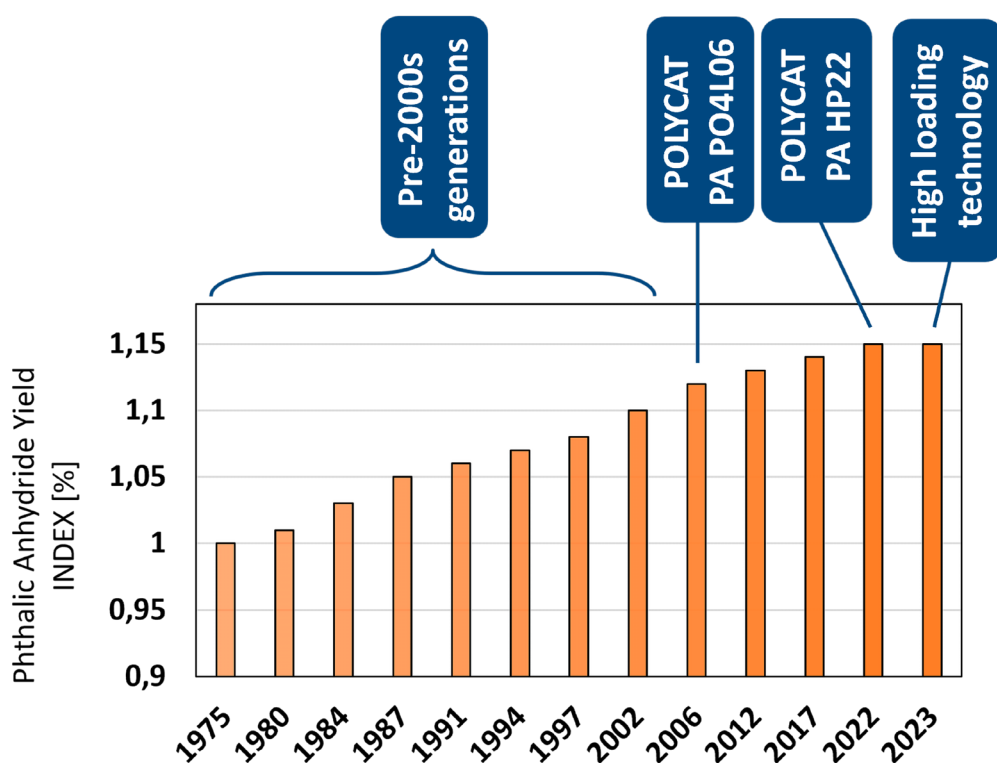
Polynt boasts 70 years of know-how in phthalic anhydride production and more than 50 years of experience and expertise in the production of catalysts for the conversion of o-xylene to phthalic anhydride through fixed bed technology. The first batches of phthalic anhydride catalyst were sold in the 1970s and several subsequent catalyst formulations have been developed over the years through focused research. In the early 2000s, the intensification of R&D activities led to the release of a new catalyst generation, POLYCAT-PA PO4L06, which marks the modern era of Polynt's PA catalysts. The very first catalyst generation of the new millennium was created to deliver excellent performances for many years.



POLYCAT-PA CURRENT GENERATION

At Polynt, the R&D department has been working vigorously to improve catalyst performance by fine-tuning properties and perfecting the preparation method, even within the same catalyst generation. Catalyst yield to phthalic anhydride increased over the years, reaching remarkable values with the new POLYCAT-PA HP22 generation, developed in 2022. In addition to a higher yield, the last generation of catalyst presents a slower rate of deactivation, allowing for a longer life with a superior performance. In 2023, POLYCAT-PA HP22 was validated for high-loading technology.

More detailed information about the new generation POLYCAT-PA HP22 is provided at page 10 of this document.



(*) Performance INDEX are calculated using year 1975 as a reference

POLYCAT-PA: Catalyst Portfolio

	POLYCAT-PA PO4L06	POLYCAT-PA HP22
Application	Gas phase oxidation of o-xylene to phthalic anhydride for fixed bed technology	
Composition	Promoted V ₂ O ₅ - TiO ₂	
Catalyst shape	Hollow cylinders	
Catalyst size	O.D. = 7 mm I.D. = 4 mm H = 7 mm	
Catalyst configuration	4 Layers	
Catalyst performance	Standard	Increased yield Slower deactivation
Delivery state	To be activated after loading	
Start-up time	1 month	

Typical Operating Conditions

	POLYCAT-PA PO4L06	POLYCAT-PA HP22	
	STANDARD OPERATING CONDITIONS	STANDARD OPERATING CONDITIONS	HIGH-LOAD OPERATING CONDITIONS
O-xylene inlet concentration	Up to 80 g/Nm³		Up to 100 g/Nm³
O-xylene slippage	300 mg/Nm³ max		
Air feeding	Up to 4,000 Ndm³		
GHSV	Up to 2,800 h ⁻¹		Up to 2,400 h ⁻¹
Inlet pressure	0.4-0.5 barg		
Salt Bath Temperature (SBT)	Initial: 385 °C Start of run: 350-355 °C End of run: 365-370 °C	Initial: 390 °C Start of run: 350-355 °C End of run: 365-370 °C	
Hot Spot Temperature (HST)	410-450°C max, or as agreed with POLYNT		

Typical Reactor Design

	POLYCAT-PA PO4L06	POLYCAT-PA HP22
Number of tubes	Up to 20,000	
Inner diameter of tubes	25 mm	
Tube Length	Up to 3,200	3,200 – 3,700 mm



COMPANY ADDRESSES

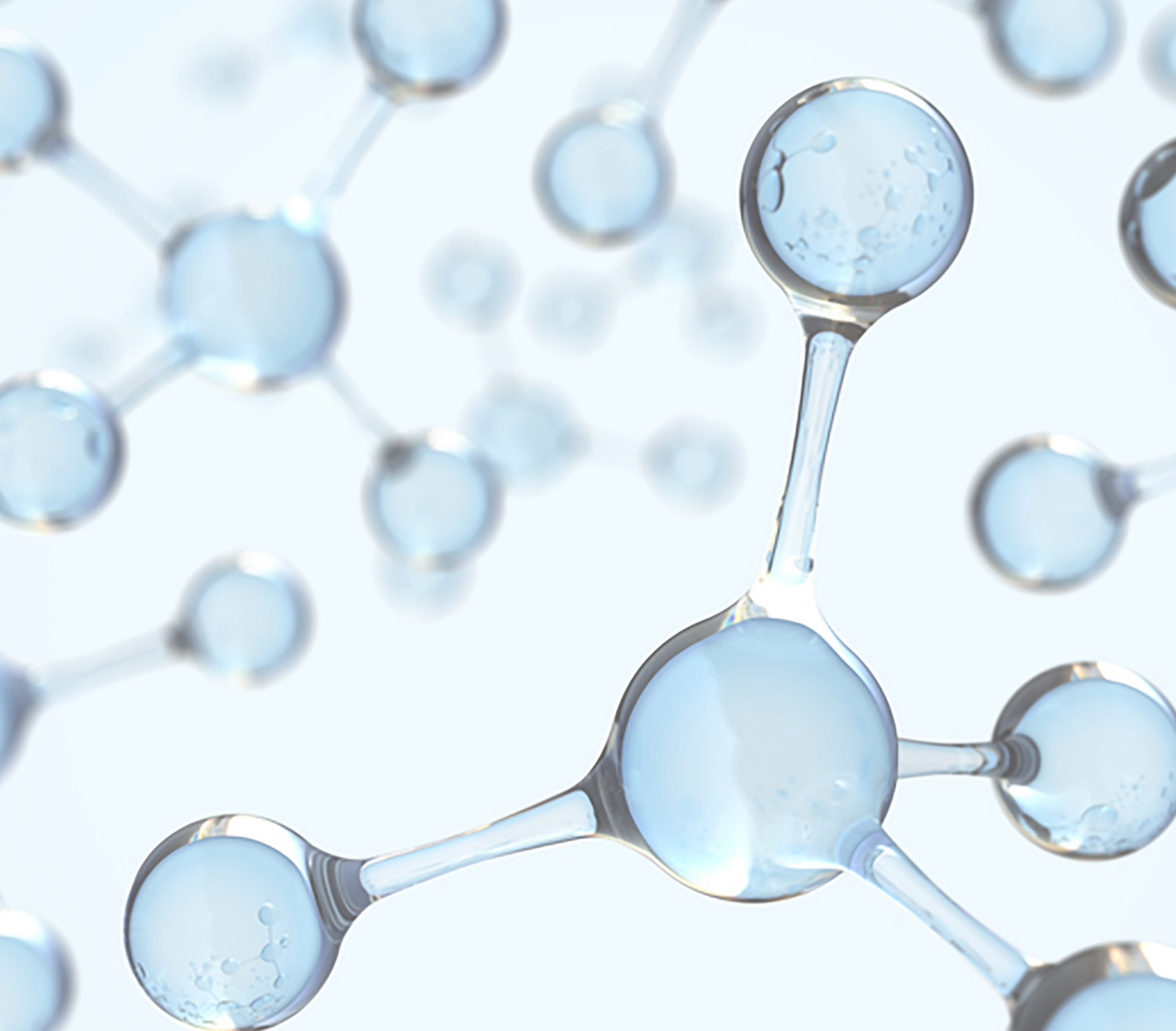
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