

CUSTOMIZING TOMORROW'S INNOVATIONS

Styrenic solutions for the electronics industry



INEOS
STYROLUTION

Driving Success. Together.

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IMAGINE

BREAKING THE MOLD

As Chief Design Engineer for a global electronics company, Paolo is always dreaming up unique features to build into the next generation of products. For a new mobile office equipment suite, for instance, Paolo was determined to find a good-looking exterior material that offered exceptional inward thermal resistance. He knew he had hit gold when INEOS Styrolution introduced him to specialty styrenics. He never would have imagined that styrenics themselves can be a disruptive technology.

» WHAT ARE THE UNIQUE PROPERTIES OF STYRENICS THAT MAKE THEM SO ATTRACTIVE TO THE ELECTRONICS SECTOR?



Picture: Lars Dombrowski/LD

LIFE IN THE FAST LANE

In the electronics industry, trends in global production and consumption are driving demand for lower weight and lower costs, as well as higher thermal endurance and energy efficiency. Transformations in lifestyle and work dictate ever new changes in usage, while connectivity, convergence, regulation and innovation are relentlessly raising the stakes for everyone. Meanwhile, increasing wealth has

created new consumers, as well as fuelling an affinity for leapfrogging technologies. In nearly every global market the value chain has become vastly more complex. For everything from aesthetics and haptics to the bottom line, the only fixed point is change itself.

AFFORDABLE INNOVATION

Styrenics are a family of unique polymers with a broad range of applications – from bike helmets, car trims, and toys to smart phones, refrigerators, and inhaler – making styrenics one of the world’s most important thermoplastics. The balanced performance of such properties as excellent aesthetics and high color consistency makes styrenics attractive to designers and manufacturers at every level. Their superior processing abilities also make changes in design of even complex structures simpler and more cost-effective – one big reason styrenic solutions are being used in ever more electronic applications.

INEOS Styrolution is a worldwide leader in electronic specialty styrenics, with a deep understanding of the industry, its rapid pace, high standards and value chains. As a reliable global supplier, INEOS Styrolution also delivers broad application expertise, a long-term commitment to innovation, and opportunities for product co-development right from day one of a new idea. In addition, INEOS Styrolution dedicates significant resources to the development of electronic solutions for tomorrow, to meet the global challenges of today.

PROPERTIES WITH A HIGH PROFILE

Here are some of the reasons styrenics are becoming the polymers of choice for the electronics industry:

HIGH UV RESISTANCE & STABILITY
LOWER PROCESSING COSTS
 EXCELLENT WEATHERING RESISTANCE **STREAMLINED**
HIGH DIMENSIONAL PRODUCTION PROCESSES
STABILITY VERY GOOD FLOWABILITY
 SUPERIOR SURFACE GLOSS
EXCEPTIONAL EASE
 DURABLE **OF PROCESSING**
 COLOR FASTNESS HIGH IMPACT STRENGTH OPTIMAL SCRATCH RESISTANCE
HIGH COLOR CONSISTENCY
 AMORPHOUS STRUCTURE SUPERB CHEMICAL RESISTANCE
EXCELLENT SURFACE
APPEARANCE
 EXCELLENT ESCR VERY GOOD INSULATING ATTRIBUTES **LOW MATERIAL DENSITY**



DISCOVER

GETTING A MOVE ON THE MARKET

Li Wei is Head of Engineering at a Chinese electronic manufacturing services (EMS) company that is steadily moving up-market. His company tasked him with quickly identifying and obtaining a steady supply of transparent, environmentally friendly and heat-resistant polymer blends for LED-TV backlight panels for export to the USA. Li Wei turned to his most trusted materials partner – INEOS Styrolution – who helped make the product (and Li Wei) look exceptionally good.

» WHY ARE STYRENIC SPECIALTY SOLUTIONS SO ATTRACTIVE TO CONSUMERS, DESIGNERS AND MANUFACTURERS?



LOOKING BETTER IS GETTING EASIER

Styrenics are all around us, whether we realize it or not. For instance, the Light Diffuser Plate (LDP) for your LCD-TV backlight system might be utilizing the high molecular weight, high heat resistance and high mechanical strength of styrenic polymers. Or the transparent glass in your home office scanner may be using an acrylic copolymer for its exceptional clarity and rigidity.

Besides their technical advantages, styrenics help products look better, too. The outstanding aesthetics bring high color and high gloss to any electronic device. And their design and manufacturing flexibility makes styrenics attractive to engineers and designers, as well. That flexibility is also pointing the way toward future electronic applications, such as LED lighting or revolutionary 3D printers.

STYRENIC APPLICATIONS – CONNECTING THE WORLD

Here are some of the reasons specialty styrenics are becoming the polymers of choice for the electronics industry:

COMMUNICATION & MOBILE APPLICATIONS

- Cell phones
- Smart phones
- Tablet computers
- Stationary computers
- GPS devices
- Landline telephones
- Telefax machines
- Antennae & communication systems

TV & MONITOR APPLICATIONS

- Light diffuser plates (LDP)
- Light guide panels (LGP)
- Front, middle & rear covers
- Guide stand necks
- Stand bases

OFFICE EQUIPMENT APPLICATIONS

- Printer, copier & scanner housing parts
- Paper trays, feeders, separators & exteriors
- Document backing
- Light pipes
- Transparent photo trays
- Printer drum units
- Printer platens
- Ink & toner cartridges

LEISURE APPLICATIONS

- Game consoles
- Audio, video & photo devices
- E-book readers
- Walkie talkie systems
- E-music instruments
- E-bikes
- Sound systems

GENERAL ELECTRONIC APPLICATIONS

- Electrical installations
- Plugs & switches
- Battery housings
- Payment devices
- House electronics (home safety & communication systems)

COMING ATTRACTIONS – STYRENIC APPLICATIONS IN DEVELOPMENT

- › LED – INEOS Styrolution R&D is developing highly transparent styrenic plastics that enable thinner, larger and higher resolution flat screens and LED lighting solutions.
- › 3D printers
- › Power tools
- › Mobile computing
- › Energy production and storage

INEOS STYROLUTION'S MANUFACTURING CLOSE TO CUSTOMER MARKETS

As the worldwide preferred partner for the Electronics industry, INEOS Styrolution is a reliable global supplier with wide-reaching application expertise and a long-term commitment to innovation as well as cost-cutting solutions. INEOS Styrolution has established a global network of sales and market development experts dedicated to co-creating solutions with our customers. Where ever in the world our customer's R&D centers and production facilities are located or if production shifts to another region – we provide solutions for cost competitive products for mature markets as well as high innovative solutions for new fields of application of tomorrow.



¹INEOS Styrolution acts as exclusive distributor for the INEOS ABS plant in Addyston, Ohio.

STYRENIC INNOVATION MAKES THESE ELECTRONICS APPLICATIONS POSSIBLE – AND MANY OTHERS

Novodur®

- › High flowability
- › Electroplating grade

Terluran®

- › Easy processing
- › High color consistency
- › Well balance of properties

Styrolution® PS

- › Easy processing
- › Good color consistency
- › Well balance of properties

Novodur®

- › Good impact strength
- › Surface quality
- › Dimensional stability

Terluran®

- › Easy processing
- › High color consistency
- › Well balance of properties

Styrolution® PS

- › Easy processing
- › High gloss
- › Well balance of properties

Luran® S

- › High UV resistance
- › Excellent ESCR
- › Superb color retention





PERFORM

LEAPING AHEAD
OF THE CURVE

To improve profit margins, a traditional European electronics firm was planning to move production of its mature-market products to Vietnam. As Head of Procurement, Hans was responsible for determining the locations to which crucial chemical compounds could be reliably delivered. Key Account Managers at INEOS Styrolution customized an affordable solution, enabling production, and a timely promotion for Hans.

» HOW DOES INEOS STYROLUTION FACILITATE THE DEVELOPMENT AND IMPLEMENTATION OF INNOVATIVE ELECTRONIC SOLUTIONS?

HOW INEOS STYROLUTION SERVES YOU

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INNOVATION THAT KEEP YOU ON TRACK – SERVICE THAT KEEPS YOU ON TIME

INEOS Styrolution invests its success in the success of its customers. To grow customer value, INEOS Styrolution offers exceptional global presence, reliability and sustainability. With innovations ranging from high quality plastic design and durable colors to an expanding array of alternatives to keep customer costs low, INEOS Styrolution R&D offers state-of-the-art materials solutions.

Simply put, INEOS Styrolution provides customers with the broadest styrenic portfolio on the market. Customers can also look forward to the world's largest single steady supply of cost-efficient, high quality products and impeccable aesthetics. Whatever the challenge, INEOS Styrolution provides a solution, from cutting-edge customized specialty products for premium branding, to products for generic commodities.

INNOVATIVE PORTFOLIO

INEOS Styrolution specialty solutions include:

- **ABS** – acrylonitrile butadiene styrene copolymers
 - Terluran® – sets worldwide standards for very high gloss, easy processing, high color consistency with low yellow index and a superb balance between flowability and mechanical properties.
 - Novodur® – grades offers superior performance in a well-balanced mix of properties, combining high impact strength, dimensional stability, creep resistance and a good surface appearance with chemical resistance, heat resistance, thermal cycling performance and excellent thermoforming attributes.
 - Absolac® – offers a well-balanced mix of properties for injection molding, including good impact strength, dimensional stability and heat resistance (available in India).
- **ASA** – acrylonitrile styrene acrylate copolymers
 - Luran® S – is a benchmark styrenic polymer for weather resistance, high UV resistance, excellent environmental stress cracking resistance (ESCR), good impact resistance, excellent chemical resistance and superb color retention.

AT YOUR SERVICE

Unprecedented service is another factor that sets Styrolution products apart:

▶ LONG-TERM GLOBAL SUPPLY SECURITY

▶ DEDICATED QUALITY

and technical teams

▶ HIGH LEVEL OF PRODUCT CUSTOMIZATION

possible per requirements

▶ ON-SITE PROCESSING SUPPORT

▶ ENHANCED QUALITY CONTROL PROCESSES

ISO 9001

▶ GLOBAL REGULATORY & COMPLIANCE SUPPORT

- **SAN** – styrene acrylonitrile copolymers
 - Luran® – injection grade provides an exceptional combination of high gloss, excellent transparency, good chemical resistance, high stiffness, extraordinary heat resistance and very good dimensional stability.
 - Absolan® – offers a well-balanced property profile ranging from excellent transparency and good chemical resistance to high stiffness and good dimensional stability (available in India).
- **Other styrene-based copolymers**
 - NAS® (SMMA) – is considered the premium choice for ESCR strength, high stiffness, extreme transparency, superior processability, mechanical strength and resistance to alcohol.
 - Terluc® (MABS) – gives excellent transparency, brilliant gloss, impact resistant, good ESCR, good chemical resistance, easy to process.
 - Zylar® (MBS) – offers superb transparency, impact resistant, superior processing flow, good detergent resistance, competitive cost.
 - Clearblend® (MBS) – provides a unique balance of clarity, toughness, low density and ease of processing, in a cost effective dry blend form (not available in all markets).
- **Copolymer blends**
 - Luran® SC (ASA/PC) – delivers very great heat resistance (one flame-retardant grade meets UL 94 test standards at V 0, great stiffness, excellent impact strength)
 - Terblend® N (ABS/PA) – combines excellent impact strength and chemical resistance with high melt flow and good acoustic dampening.

COMPREHENSIVE RANGE

Styrolution PS is a family of general-purpose transparent polystyrene resins suitable for injection molding or extrusion applications:

- **GPSS** – (general purpose polystyrene) offers color consistency, excellent transparency and easy processing.
- **HIPS** – (high impact polystyrene) offers color consistency, good balance between flowability and mechanical properties such as impact and tensile strength, and easy processing.

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COLLABORATE

COLLABORATING

FOR LASTING BALANCE

When she was recruited as Head of Design for a start-up mobile device firm, Alice knew that the future of her job would be contingent on getting a cutting edge product to market – on time and on budget. Alice envisaged using a material that combined low density with exceptional flowability and high gloss. And she would need it in India. What Alice needed didn't exist until she contacted INEOS Styrolution. Together, they co-created that material. Two years later, the new device she designed is now a modern legend.

» WHY DO ELECTRONICS MANUFACTURERS PREFER STYROLUTION TO OTHER STYRENIC SOLUTION PROVIDERS?

A PIONEER GOES FURTHER WITH A RELIABLE PARTNER

INEOS Styrolution offers global assistance with a personal touch. Whenever specialized innovation is required, INEOS Styrolution works shoulder-to-shoulder with its customers to help them gain a competitive advantage – through best-in-class service, reliable formulations, and customized solutions.

With first-rate technology, leading R&D skills and strong intellectual property and patent positions, INEOS Styrolution is uniquely equipped to ensure that new applications find the right formulation for success. To enable best possible quality and process efficiency, INEOS Styrolution provides testing and technical support in the processing, design and computer simulation phases, as well.

Thanks to its broad experience and processing expertise, INEOS Styrolution is an attractive partner for developing new products, technologies and solutions for electronics customers.

TURNING IDEAS INTO PROFITS

Each new product or application begins with an idea. Together with INEOS Styrolution, customers define how those ideas are transformed into real, innovative and practical items for use in the electronics sector.



TEXTURE

Styrenics are widely appreciated for their attractive aesthetics. From glossy to smooth to easy-grip/no-slip surfaces: the look, feel and safety are all premium.



SHAPE

Tough, flexible, thin, robust: INEOS Styrolution helps customers find the right blend for the size and requirements of their application.



COLOR

Customers can choose from over 2,500 existing pre-tested colors or use the INEOS Styrolution Color Excellence Center (CEC) to customize any color and confirm its performance.

WHY COLLABORATING WITH INEOS STYROLUTION IS DIFFERENT: STEP BY STEP

- 1 Electronics manufacturer has an idea or faces a challenge and communicates this to INEOS Styrolution.
- 2 INEOS Styrolution listens, reflects and asks questions to further clarify the requirements.
- 3 INEOS Styrolution draws on its wide expertise and global presence to present the customer with the optimal mix of existing formulations and promising fields of development.
- 4 INEOS Styrolution delivers customized products for customer sampling and test evaluation according to specifications.
- 5 Customer and INEOS Styrolution finalize plans to co-develop the new product/application.
- 6 Commercial production of electronic product begins.



SUCCEEDED

BUILDING ON

A SOLID FOUNDATION

INEOS Styrolution is the only global company focused solely on styrenics with a broad product portfolio and proven customized approach to co-development. INEOS Styrolution delivers innovation and professional support with an experienced, personal touch.

INEOS STYROLUTION AT A GLANCE

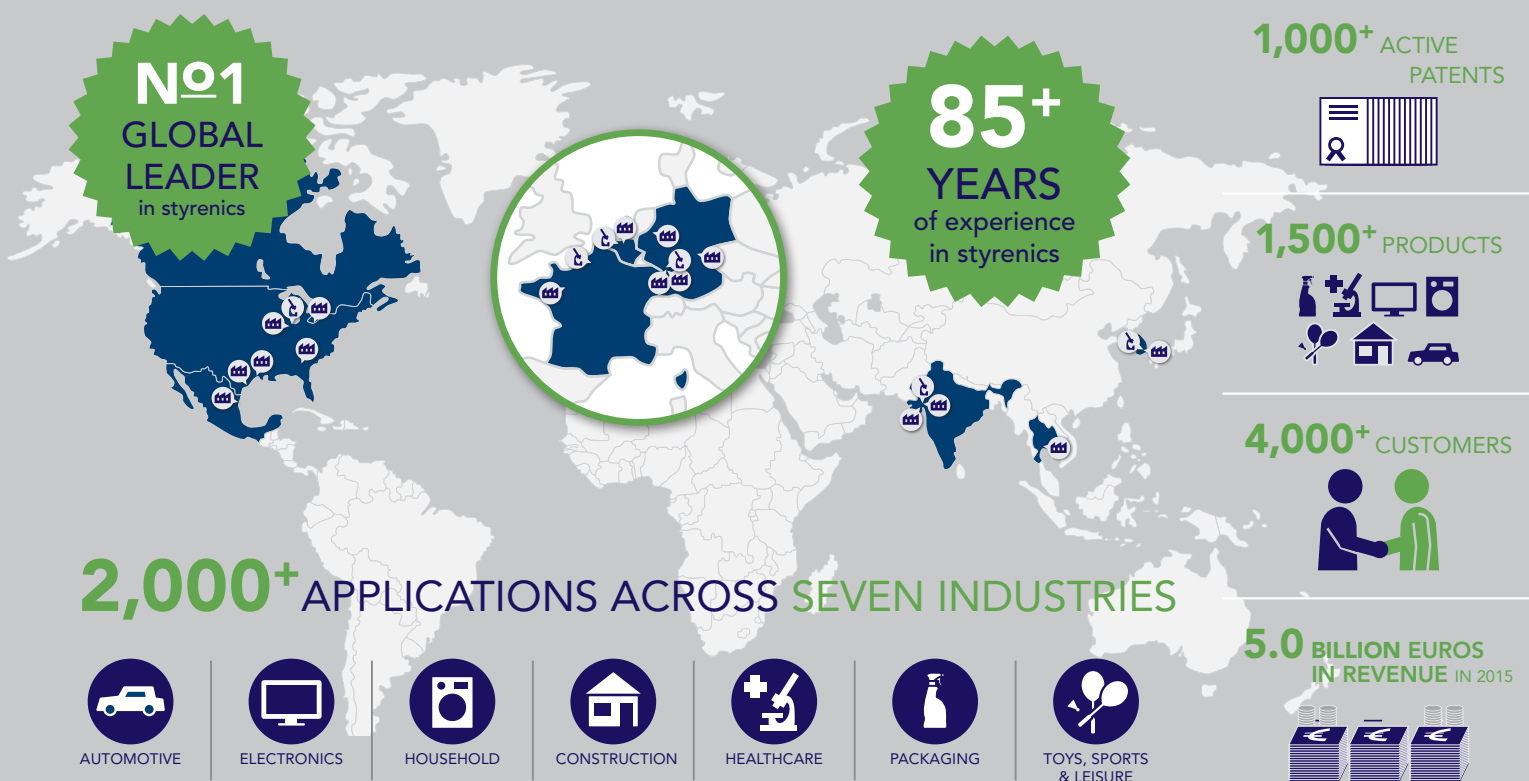
INEOS Styrolution is the global leader in styrenics – and the world’s leading supplier of automotive styrenics. The company also provides styrenic applications for many everyday products across a broad range of other industries, including healthcare, electronics, household, construction, toys/sports/leisure, and packaging.

 **3,100**
EMPLOYEES

 **9**
COUNTRIES

15 
PRODUCTION SITES

 **6 R&D**
CENTERS



Nº1 GLOBAL LEADER in styrenics

85+ YEARS of experience in styrenics








1,000+ ACTIVE PATENTS

1,500+ PRODUCTS

4,000+ CUSTOMERS

2,000+ APPLICATIONS ACROSS SEVEN INDUSTRIES

5.0 BILLION EUROS IN REVENUE IN 2015

-  AUTOMOTIVE
-  ELECTRONICS
-  HOUSEHOLD
-  CONSTRUCTION
-  HEALTHCARE
-  PACKAGING
-  TOYS, SPORTS & LEISURE

STYROLUTION SERVES THE ELECTRONICS INDUSTRY AROUND THE WORLD WITH THE LARGEST PORTFOLIO OF STYRENICS, POWERED BY CUTTING-EDGE INNOVATION.

INEOS Styrolution Group GmbH

Global Headquarters

Erlenstrasse 2

60325 Frankfurt am Main, Germany

www.ineos-styrolution.com

PLEASE NOTE

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