

KUNSTSTOFFE 2010
October 27th to November 3rd 2010
Stand C57 - Hall 6

Arkema at K 2010: Materials at the Cutting Edge of Technology

Arkema has turned ecotechnologies into reality with increasingly efficient materials that are key to the competitiveness of its downstream markets: the growing use of renewable raw materials, thermoplastics and nanostructured composites for lighter cars and aircraft, as well as solutions for storing energy and improving the yield of solar photovoltaic devices. Arkema's biosourced polymers and ultra high performance materials are helping meet all these challenges.

At K 2010 Arkema is showcasing its extensive range of specialty polymers, the concrete embodiment of its R&D drive to develop innovative chemicals that increasingly focus on the challenges of sustainable development.



« Today, our chemists compose tomorrow's materials »

Developing chemicals from plants

Bio-sourced plastics today account for 30% of Arkema's technical polymer business, taking up around 2/3^{rds} of its R&D activity. These plastics feature properties that are equivalent or superior to those of their fossil-fuel-based counterparts.



Arkema's expertise in castor oil chemistry for over 60 years with its **Rilsan**[®] polyamide 11, 100% derived from this chemistry, recently helped bring out four new polymers:

- **Pebax**[®] **Rnew**, a biosourced elastomer up to 90% derived from castor oil,
- **Platamid**[®] **Rnew**, the first hotmelt adhesive entirely of renewable origin,
- **Rilsan**[®] **Clear Rnew**, the first transparent 54% biosourced polyamide
- **Rilsan**[®] **HT**, an ultra tough high temperature polymer fulfilling today's general need for lighter materials.



An illustration of Arkema's R&D in biosourced polymers...

***Rilsan**[®] **HT**, the latest arrival in this family, is one of the rare polymers based on polyphthalamide (PPA) capable of replacing metal used for pipes subjected to high temperatures in automotive under-the-hood applications. The **Rilsan**[®] **HT** resin offers another unique characteristic for PPA-based materials, flexibility, thereby opening up hitherto inconceivable possibilities to replace metal. **Rilsan**[®] **HT** pipes help cut down manufacturing costs by up to 50%, and significantly reduce the weight of many engine parts compared to metal assemblies. Furthermore, Arkema offers a unique range of polyphthalamides accommodating every converting technique (extrusion, blow moulding and injection moulding), which allows much freedom in terms of assembling moulded components (connectors) with extruded components (flexible pipes). **Rilsan**[®] **HT** resins contain up to 70 % biosourced carbon, and therefore fulfil the increasingly stringent environmental objectives of the automotive sector.*



To enable its customer to identify products derived wholly or in part from renewable raw materials (over 20% carbon of non-fossil origin), Arkema has devised the « Arkema Renewables » label. The evaluation of the products' renewable carbon content is carried out by an independent body based on the ASTM 6866 standard.

Innovating with ultra high performance materials

Already present in the ultra high performance materials sector with world-renowned products and tradenames such as **Kynar**[®] fluorinated polymers, **Rilsan**[®] polyamides, and **Pebax**[®] thermoplastic elastomers, Arkema is now developing new polymers with outstanding properties, the result of innovation from its R&D or the acquisition of new technologies.

Several of these materials already have industrial applications, in particular transparent polyamides, high temperature polyamides, specialty materials dedicated to photovoltaics (fluorinated polymers, PMMA, and EVA copolymers), and OXPEKK[®] polyether ketone ketone.

An illustration of Arkema's expansion in ultra high performance materials: PEKK, polymer of the extreme...

*In line with its ongoing development strategy in performance materials, Arkema acquired at the beginning of 2009 the American company Oxford Performance Materials (OPM), which manufactures polyether ketone ketone (PEKK), ultra high performance technical polymers marketed under the tradename **OXPEKK**[®].*

Among the family of thermoplastic polymers, PEKK boasts one of the highest performances: it features outstanding properties, in particular excellent continuous high temperature resistance (up to +260°C) and resistance to chemicals, unrivalled abrasion resistance, and inherent fire resistance. It has already found many applications, in particular in aerospace, oil prospection, and the medical sector.



Fluoropolymer materials: a valuable offering for green technologies

Thanks to their outstanding properties, Arkema's polymers, in particular **Kynar® PVDF** (polyvinylidene fluoride), are assisting with the development of photovoltaic panels and lithium-ion batteries by enhancing their performance.

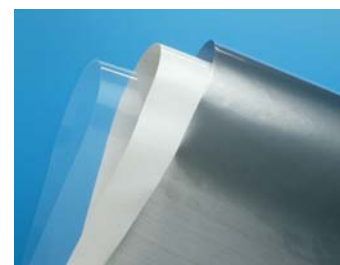


From the very beginning of lithium technology, Arkema has worked closely with scientists to design batteries with higher charge density. This has resulted in **Kynar®** and **Kynar® Flex** specific resin grades that are excellent polymers for use in both polymer and liquid cell lithium batteries.

Of special interest is Arkema's new binder for lithium-ion batteries, **Kynar® HSV 900 PVDF**, a high molecular weight resin that provides superior adhesion with reduced loading in electrode construction. This grade enhances the performance of both lithium phosphates and metal oxides. **Kynar®** resins are highly stable polymers that offer an exceptional balance of performance properties (high electrochemical, thermal and chemical stability, excellent adhesion within electrodes, high purity).



Green technology also means photovoltaic technology, in which Arkema has become a leader in supplying ultra tough **Kynar®** film for use in the multilayer backsheet of PV panels. Developed by Arkema's R&D, these polyvinylidene difluoride films are produced using a very flexible and cost-effective blown film patented technology. This Arkema technology allows mass production of quality and high durability films that are now widely used in the photovoltaic industry.



Kynar® Film combines many benefits: permanent resistance to sunlight and temperature variations, full UV opacity, good barrier to moisture, and stability of white color to help reflect light towards the silicon.

K 2010 is also an opportunity for Arkema to present the following new developments:

- a new brandname for its polyamide 12 and a new look for its polyamide 11 identity,
- **Durastrength® 365**, a unique innovation in the acrylic impact modifier market for PVC window profiles offering an unsurpassed cost/performance balance,
- **Altuglas® HFI 10 Super Matt**, a new grade from *Altuglas International*, an Arkema subsidiary, which features exceptional satin finish and very good scratch resistance,
- New **Rilsan® Clear** grade with an improved impact resistance for safety optical applications,
- a new **Kynar Flex®** PPA grade used as a process aid for polyolefin resins (LLDPE, HDPE, PP) suitable for many industrial applications including film extrusion, blow-moulding, and pipe extrusion.

Visit us on **stand C57 Hall 6** to find out about the countless applications of our technical polymers (Rilsan[®] polyamide 11, Rilsamid[®] polyamide 12, Pebax[®] elastomer, Kynar[®] PVDF fluorinated polymers, functional additives (PVC stabilizers, impact modifiers, and process aids), Lotryl[®], Orevac[®], Lotader[®] and Evatane[®] functional polyolefins, Altuglas[®] acrylic resins, PVC polymers (general purpose, PVC paste, emulsion and micro-suspension, chlorinated PVC), as well as our Graphistrength[®] range of carbon nanotube masterbatches and our new OXPEKK[®] ultra high performance polymer.

A global chemical company and France's leading chemicals producer, **Arkema** is building the future of the chemical industry every day. Deploying a responsible, innovation-based approach, we produce state-of-the-art specialty chemicals that provide customers with practical solutions to such challenges as climate change, access to drinking water, the future of energy, fossil fuel preservation and the need for lighter materials. With operations in more than 40 countries, 14,000 employees and seven research centers, Arkema generates annual revenue of €5.5 billion and holds leadership positions in all its markets with a portfolio of internationally recognized brands. **The world is our inspiration.**

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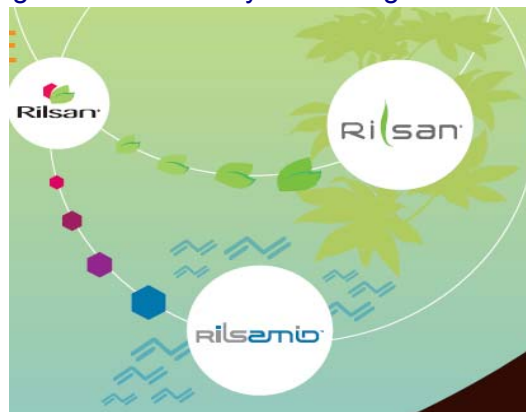
NEW DEVELOPMENT - KUNSTSTOFFE 2010

**Arkema unveils a new brandname for its polyamide 12
and a new look for its polyamide 11 at K 2010**

With leading capacities in polyamides 11 and 12, global coverage, and superior regional service from production and research facilities in Asia, North America and Europe, Arkema is a world-renowned player in technical polyamides. Building on its leading position, and in order to reinforce its unique differentiation, Arkema is launching a new identity for its high performance polyamides.

Rilsan® PA12, Arkema's fuel-based polyamide, is changing its name to **Rilsamid™**, while **Rilsan® PA11**, Arkema's 100% biosourced polyamide, is revamping its visual identity with a logo reflecting more closely its distinctive high-performance and biobased positioning.

These brand identity changes are designed to clearly differentiate Arkema's PA11 and PA12 from each other and from the market. Since their launch, both these polyamides have been used in many varied applications, including: oil and gas pipes, electronics, fuel lines, and even textiles. Under these new identities, Arkema will continue to provide the same high quality products, while upgrading the level of service that customers have come to expect.



Rilsan® and **Rilsamid®** are materials of choice for applications in which safety, durability or reliability are critical. They deliver exceptional performance across a broad spectrum of key physical properties such as chemical and abrasion resistance, weathering resistance, temperature stability, barrier property, and flexibility.

The 100% renewable-based **Rilsan®** offers customers unmatched value resulting from the combination of unique properties enhanced by environmental benefits.

These new identities will soon appear on packaging, technical and safety datasheets, invoices, promotional material, and product literature.

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NEW DEVELOPMENT - KUNSTSTOFFE 2010

APPLICATION: PVC window frames

***Durastrength*[®] 365: Arkema's new impact modifier composite
for PVC window profiles**

Developed from a unique patented innovation in the acrylic impact modifier market, *Durastrength*[®] 365 aptly combines carefully selected mineral additives with high elastomer content acrylic components.

The result of this combination, fine-tuned over many years of research, offers an unrivalled cost/performance balance. The outstanding synergy of the components of *Durastrength*[®] 365 offers customers:

- excellent processability, so that *Durastrength*[®] 365 may be used in the same conditions as other modifiers,
- optimized impact properties fulfilling the best standards for PVC windows in force in Europe,
- even safer PVC window frame assembly thanks to superior corner joint strength,
- powder characteristics of *Durastrength*[®] 365 (flow behaviour, density, low explosivity) among the best in the market.

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NEW DEVELOPMENT - KUNSTSTOFFE 2010

APPLICATIONS: sanitaryware, home appliance, transportation, furnitures

Altuglas® HFI 10 Super Matt, the highest matt PMMA grade available on the market

Altuglas International has recently developed a new super matt PMMA grade, ***Altuglas® HFI 10 Super Matt***, that offers a unique and spectacular matt finish, retaining the key properties of PMMA such as weathering resistance and toughness, combined with a very pleasant soft touch.

With this latest development, Altuglas International introduces the highest matt PMMA grade available on the market. The particular manufacturing process of ***Altuglas® HFI 10 Super Matt*** helps achieve an exceptional impact/matt balance, with a matt finish that is barely sensitive to extrusion or injection moulding conditions. ***Altuglas® HFI 10 Super Matt*** also offers high scratch resistance, and a very high matt level of extruded sheet retained after thermoforming.

In addition to its exceptional qualities, ***Altuglas® HFI 10 Super Matt*** is easy to process thanks to its rheology perfectly adapted to injection moulding, extrusion and coextrusion processes. A constant high matt finish is thus achieved easily.

Altuglas® HFI 10 Super Matt is the ideal solution for the production of sheet, film, profile, tube and finished articles. It is available in a clear version, but can also be coloured like any other PMMA grade without impairing its high matt finish. It has been designed to perfectly meet the latest demand for high matt products in markets such as sanitaryware, home appliance, transportation, construction and furniture in which its superior resistance to fingernail scratches and its low sensitivity to fingerprints are much appreciated.



Altuglas International, a 100% subsidiary of the Arkema Group, is the PMMA world leader, producing 20% of world demand in the form of sheet, block and resin. Its PMMA trademarks are Plexiglas® on the American continent and Altuglas® in the rest of the world.

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NEW DEVELOPMENT - KUNSTSTOFFE 2010

APPLICATIONS: optics.

New *Rilsan*[®] Clear grade for an improved impact resistance

Arkema has enhanced its range of *Rilsan*[®] Clear transparent polyamides with a new high impact grade, *Rilsan*[®] Clear G300 HI.

Arkema's *Rilsan*[®] Clear polyamides feature light weight, chemical resistance, remarkable sturdiness, as well as outstanding transparency, even with a high thickness, allowing a freedom of design and style that is much appreciated by spectacle frame manufacturers. These transparent polyamides have been specifically developed for injection moulding applications, and so are aptly suited to the optical market.

The *Rilsan*[®] Clear G300 HI grade offers a unique balance of transparency, impact resistance, light weight, chemical resistance and ease of molding processing.

These characteristics mark *Rilsan*[®] Clear 300 HI out as a material of choice for safety and industrial applications.

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NEW DEVELOPMENT - KUNSTSTOFFE 2010

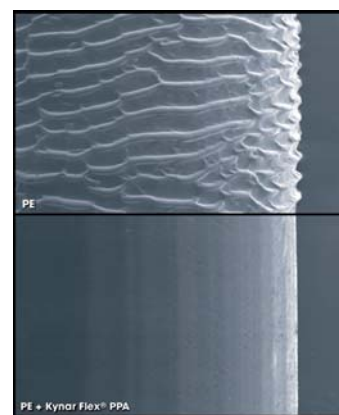
APPLICATIONS: process aids for polyolefin resins

**New Kynar Flex[®] grades as process aids for polyolefin resins
designed for high volume resin production applications**

Arkema presents two new **Kynar Flex[®]** grades used as process aids for polyolefin resins (LLDPE, HDPE, PP) suitable for many industrial applications including film extrusion, blow-moulding, and pipe extrusion. These grades are specifically designed for high throughput resin production.

Kynar Flex[®] PPA fluoropolymer based products are incorporated into polyolefin resins as additives, at very low concentration, of the order of 0.015%-0.08% (150-800ppm), depending on the application. This low concentration is sufficient to bring considerable improvements to the manufacturing process, in terms of both quality of finished product and processing conditions.

Continuously developing its **Kynar Flex[®] PPA** range for use as process aids for polyolefin resins, Arkema has now enhanced its range with two new grades, **Kynar Flex[®] 8600** and **Kynar Flex[®] 8601**. These products are aimed more specifically at high volume resin production applications, in which the performance vs cost ratio is of prime importance. Both grades are available either as a compacted pellet or as a free-flowing powder, to suit every market requirement.



These products now further enhance Arkema's existing wide range of PPA products, which includes:

- the widely accepted **Kynar Flex[®] 5300** and **Kynar Flex[®] 5301** grades that achieve exceptionally high efficiency even in very tough systems containing other well-known antagonistic additives and fillers,
- **Kynar Flex[®] 3121-50** and **Kynar Flex[®] 2821**, which can be used when high thermal stability is required.

Finished products manufactured using **Kynar Flex[®] PPA** are free of "shark-skin" surface defects, while combining superior film transparency and mechanical properties. **Kynar Flex[®] PPA** improves the smoothness and surface finish of pipes, and the surface gloss of blow-moulded parts.

In terms of process improvements, **Kynar Flex[®] PPA** helps increase processing speed while reducing energy consumption, processing temperature and pressure. It also significantly reduces die-buildup, hence minimizing downtime.

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[Pictures available on the library on www.arkema.com](http://www.arkema.com)

→ In the “Markets” part



Scarpa ski boot in *Pebax® Rnew*



Sony soccer ball in *Pebax® Rnew*



Smith Optics sun glasses in *Rilsan® Clear Rnew*



Mizuno shoe: sole containing *Pebax® Rnew*



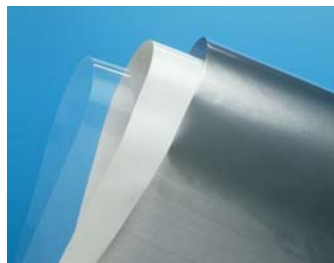
Rilsan® HT flexible tubing: an alternative to metal tubes.
Blow-By tube in *Rilsan® HT*



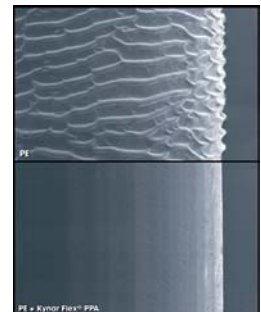
Rilsan® HT flexible tubing: an alternative to metal tubing assemblies.
Exhaust Gas Recirculation (EGR) systems in *Rilsan® HT*



Photovoltaic panels with *Arkema* polymers.



Kynar® films for PV panels back sheets



PE film without *Kynar Flex® PPA* and
PE film containing *Kynar Flex® PPA*



Kynar® PVDF in Lithium ion batteries



Altuglas® HFI 10 Super Matt, the highest matt PMMA grade available on the market

→ In “Research and innovation” part



Medical spinal implants in *PEKK* (Poly ether ketone ketone) *OXPEKK®*