The world is our inspiration

Press release

Communiqué de presse

Arkema at 25th Photovoltaic Solar Energy Exhibition
Valence – September 6th to 9th, 2010
Level 2 – Hall 4 – A25

Arkema's plastics aid photovoltaics boom!

Thanks to their innovation potential, plastics are helping in the development of photovoltaic panels, in particular by protecting the components and enhancing their performance. Arkema has been present in this market since 2001 by offering polymers that fulfill two objectives: to extend the lifetime of panels (up to 30 years), and to make their manufacture quicker and cheaper. Arkema will showcase on its booth (Level 2 – Hall 4 – A25) its four polymers and its organic peroxide specially developed for the photovoltaic sector.

- Some 95 % of solar panels currently use as active material, cells made of crystalline silicon, a costly and highly fragile material. These cells need protecting and so are encapsulated within EVA (ethylene vinyl acetate copolymer) layers. **Arkema recently launched on the market an EVA grade specifically designed for photovoltaic applications**. This resin offers key benefits: transparency, no bubble or contact defect during application, no yellowing over time, and perfect adhesion on to the panel's glass outer layer.

- To complement its EVA offer, Arkema developed **specific organic peroxide grades allowing to speed up the curing of EVA used for the encapsulation** and hence increase the production of PV panels.

- In order to ensure protection of the silicon cells from external attack, **Arkema has developed with the company Krempel a new PVDF (polyvinylidene fluoride) three-layer film (PET core layer enclosed within Kynar® PVDF outer layers). Used as protective backsheet for the panels**, its main assets include easy processing, resistance to UV moisture and temperature variations, and stability of white color to help reflect light towards the silicon.

- Today's fast expansion of solar panel technology is also prompting Arkema to design **new PMMA (polymethyl methacrylate or acrylic glass) grades capable of withstanding temperatures of up to 100°C, to replace glass as the cover material**. PMMA is easy to mould into « lenses » to help direct sunrays more efficiently onto a limited number of cells; this makes production of solar panels more cost-effective and reduces the weight of the overall device.

- Last innovation: Arkema's R&D recently developed **Apolhya® Solar, a nanostructured thermoplastic polymer** for the encapsulation of new generation photovoltaic modules (so-called « thin layer » modules). *Apolhya® Solar* combines thermomechanical, adhesiveness and creep resistance with perfect transparency. Processing requires no curing, which saves time in the manufacturing process and facilitates the recycling of end-of-life panels.

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Evatane®, *Luperox*® *Solar, Kynar*® *Film, Altuglas*® and *Apolhya*® *Solar* :
innovative brands at the service of photovoltaics

The life span of a solar panel is between 20 and 30 years. Its components must therefore ensure that it delivers excellent performance over the long term - a challenge which has now been taken up by Arkema thanks to a number of its polymers. Arkema has been present in the photovoltaics market since 2001 by offering polymers that are perfectly suited to the make-up of photovoltaic solar panels. To develop these products, Arkema implements a particularly dynamic R&D policy motivated by two objectives:
- To extend the lifetime and improve the performance of photovoltaic panels: Arkema aims to provide the players of the sector with solutions to help protect electrical circuits and active materials .
- To reduce the time and cost involved in the manufacture of panels: joint development programs are put in place with photovoltaics manufacturers in order to keep on improving manufacturing processes.

Evatane® : the ideal encapsulant for photovoltaic cells

Arkema's *Evatane*® polymers are ethylene vinyl acetate (EVA) resins with a high vinyl acetate content, used in a large number of applications: hotmelt glues, packaging film, halogen-free cable sheathing, semi-conductors, etc. In the make-up of solar panels. **EVA grades specifically designed by Arkema for photovoltaics applications (*Evatane*® 33-45 PV)** provide the adhesion of the various layers (glass, silicon, backsheet) and the protection of silicon cells and electrical circuits. *Evatane*® polymers offer the ideal characteristics of durability and stability over time for the encapsulation of the panels: outstanding transparency related to the tube production process, high UV resistance, good electrical insulation, and good crosslinking ability.

Luperox® *Solar*: ultra-fast crosslinking agents

The world's second leading producer of organic peroxides (used as crosslinking agents for EVA, rubber and polyethylene), Arkema recently developed organic peroxide grades for the crosslinking of EVA used in the encapsulation of photovoltaic cells : *Luperox*® *Solar Cure* and *Luperox*® *Solar Fast.* One particular feature of these organic peroxides is their ability to speed up the crosslinking of EVA and hence increase the production output of solar panels. Additionally, these new granule peroxides (masterbatches) are very easy to use, store and dose.

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Kynar® Film: protection for photovoltaic cells

Arkema's *Kynar*® PVDF (polyvinylidene fluoride) is a fluorinated polymer used in the manufacture of the film making up the backsheet of the panels.
With its excellent resistance to UVs and the most extreme climatic and environmental conditions, and its moisture barrier properties, it ensures the electrical insulation of the panel's backsheet over the long term. Its excellent reflectivity also helps increase the yield of the photovoltaic cells. To guarantee these properties, Arkema subjected samples to extreme conditions (temperature, moisture, UV rays, etc.) in climatic chambers which speed up ageing. The results of these tests showed that *Kynar*® *Film* offers particularly effective ageing resistance, with no yellowing or embrittlement. Arkema boasts over 40 years' experience using *Kynar*® PVDF as an architectural coating that can withstand UVs and weathering.
Recently, Arkema's R&D teams developed a KPK™ three-layer backsheet jointly with the company Krempel: These laminates comprise 3 layers : PVDF films as the 2 outer sides, efficiently protecting from UV ageing and moisture the PET core layer which imparts electrical insulation to KPK™.

PMMA: toward a new generation of concentrated photovoltaic panels (CPV)

PMMA, or acrylic glass, offers inherent qualities which make it a material of the future for the photovoltaics sector: excellent transparency, very high resistance to UVs and weathering, great design flexibility, and excellent surface hardness protecting it from scratches.
Currently, the high cost of solar panels is linked to the price of silicon. Hence researchers are looking to develop panels that produce just as much energy but with less silicon: one of the solutions consists in using lenses which focus the light onto narrow strips of silicon; this is the principle of concentrated photovoltaic technology. PMMA becomes totally relevant in this context: glass lenses are heavy and difficult to manufacture, while PMMA, with its excellent transparency, easy moulding, and durability, can be used to manufacture lenses that concentrate light efficiently (widely known as Fresnel lenses) and so help enhance the effectiveness of photovoltaic panels while reducing their cost as a smaller amount of silicon is needed.
PMMA lenses are already used in the medical and automotive sectors. However, in the case of solar panels, PMMA needs to withstand high temperatures. Altuglas International stands out in this field as it offers a product that is unique on the market: the *Altuglas*® *HT 121* grade which can withstand 100°C. This high temperature resistant grade with excellent dimensional stability can also be used for the manufacture of frontsheets for standard technology photovoltaic panels, replacing glass and so reducing the weight of the module. Altuglas International is involved in a number of research projects aimed at integrating PMMA lenses in the manufacture of solar panels.

Apolhya® *Solar*, a nanostructured thermoplastic polymer for the encapsulation of new generation photovoltaic modules

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Apolhya® Solar combines thermo-mechanical properties: adhesiveness, creep resistance, and perfect transparency. This nanostructured thermoplastic is compatible with processes used to manufacture solar panels based on crystalline silicon or thin layers. One key advantage is that its processing requires no curing. This therefore saves time in the production process, while making end-of-life panels very easy to recycle.

Apolhya™ Solar LC3 film used to manufacture crystalline silicon modules

Apolhya® Solar offers an unrivalled set of properties compared to the other thermoplastics suitable for solar panel encapsulation. The nanostructuring of *Apolhya® Solar* ensures excellent long-term transparency. Furthermore, thanks to its easy processing, adhesion properties, prolonged heat resistance (its creep resistance is excellent up to 120°C), UV stability and its low permeability, *Apolhya™ Solar* is highly suitable for « thin-layer » photovoltaic panels, including flexible modules, and particularly for continuous lamination processes.

Diagram of a solar panel manufactured with Arkema products

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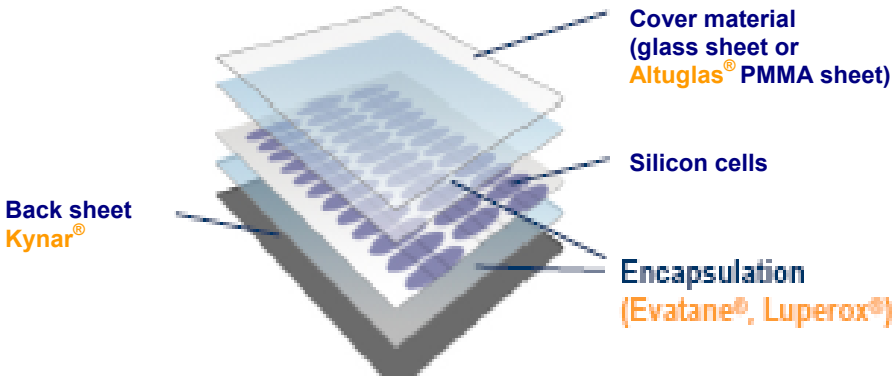

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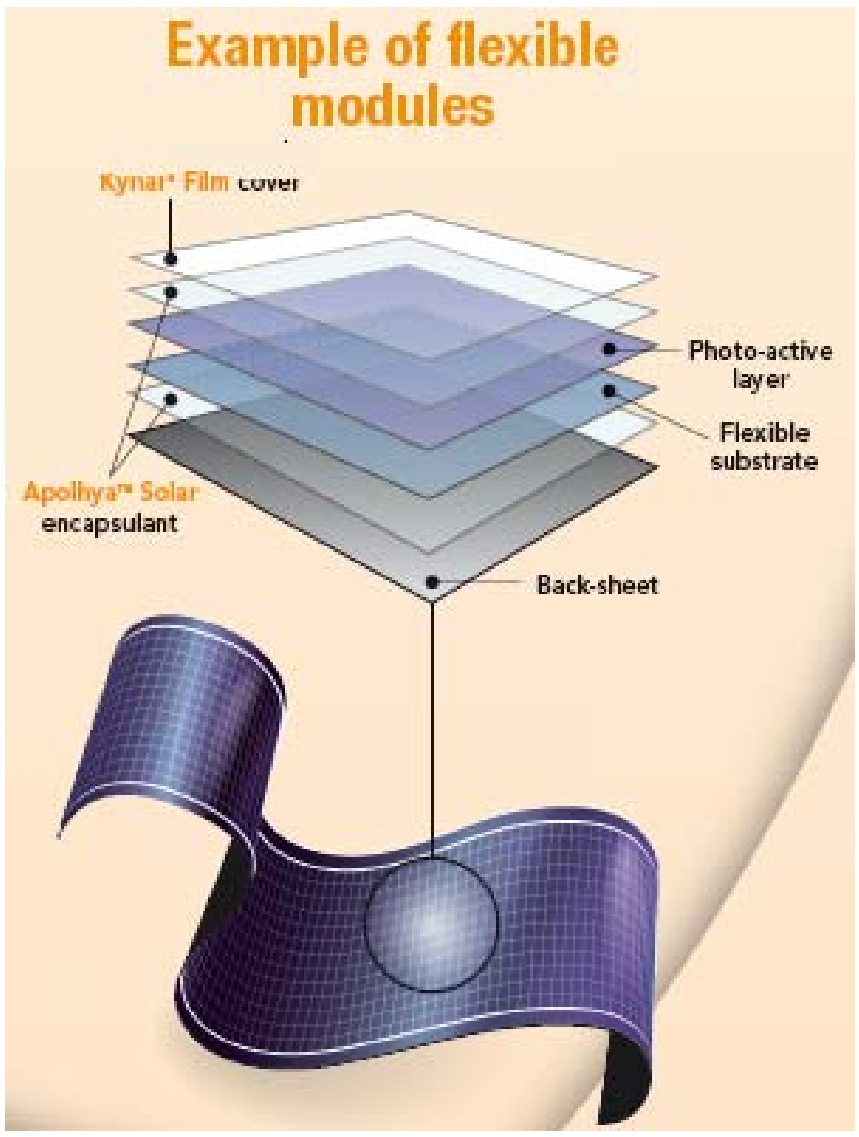

More information on:
www.apolhyasolar.com and www.arkema.com/photovoltaics

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