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EDITORIAL

Public Private Partnership

The Belgian federal government has given green light for a new important investment in the coming ESA programmes. Minister Sabine Laruelle even succeeded to convince her colleagues that Belgium should not only maintain the actual level of its participation in space, but should even increase it. Not a minor achievement for which VRI congratulates her and her staff at the cabinet and at the Belgian Science Policy Office.

We count on a well-balanced distribution of these financial means among the different regions.

VRI also hopes that after the Ministerial Council ESA continues to fulfil its role of supra national organisation, which designs and implements the European programmes. This is crucial to us: by the Belgian choice to consider ESA as an almost exclusive partner, we depend on ESA for daring international projects.

But we have our own responsibility. The Flemish companies and researchers have proven in the past that they make good use of the government investment in space. Based on the government investment they have succeeded in creating an important added value for the Flemish economy by offering state of the art products and services.

We will continue to do so. For VRI the major justification of its demand for government investments in space is to allow Flanders to enjoy the scientific and economic benefits of the worldwide space market.

This form of Public Private Partnership 'avant la lettre' has been successful and should therefore be continued.

Dirk Breynaert,
President

Realisation with the support of:

**Vlaams
Innovatienetwerk**
met steun van IWT

UMICORE SPACE PRODUCTS FIND THEIR WAY TO TERRESTRIAL APPLICATIONS IN THE SUSTAINABLE ENERGY SECTOR



Umicore is a materials technology company active in 4 different business areas: zinc specialties, advanced materials, precious metals services and precious metals products. Recycling, sustainability, emission reductions, renewable energy, cleantech are not just buzzwords for us, it's the core of a growing number of activities in our various business lines. This also holds for the business line substrates. Once only active in the space market, we're currently also present on two terrestrial markets: the LED (light emitting diodes) and the PV (photovoltaics) market.

Umicore's business line substrates is the world leader in the production of germanium wafers for use in high-efficiency solar cells, equipping most currently built satellites. They're also used in longer range missions such as NASA's Phoenix Mars Lander and in the Mars robots Spirit and Opportunity. At present, all major satellite manufacturers have switched or are in the process of migrating from Si based solar panels to gallium arsenide/germanium based ones. The latter technology offers the best power per unit mass ratio and is radiation hard, explaining its success in the satellite market. Umicore's unique crystal growth technology combined with a rapid response to market needs established us as the leading supplier to the space power industry, serving all major customers on the 3 continents.

Albeit space is today still the main market for germanium substrates, two applications in the sustainable energy sector have the potential to become the driving force behind the market for germanium wafers: LEDs and concentrator PV.

LEDs have to potential to replace incandescent lamps and compact fluorescent lamps, effectively reducing the share of lighting in the electricity bill to practically zero. Before these so-called solid state lighting solutions can break through, a number of hurdles has to be overcome. Germanium seems to be a good candidate as support for the thin light emitting layers as it efficiently evacuates the heat and, having a similar coefficient of thermal expansion as the active layers, introduces no additional stress at operating temperature.

The most exciting emerging market, however, is the one of concentrator PV (figure 1). Although significantly more expensive than silicon solar cells, the excellent conversion efficiency of state-of-the-art triple junction solar cells on germanium opens the door to this vast new market. The idea behind this technology is to combine a solar cell with concentrating optics (reflective or diffractive), effectively reducing the amount of solar cell area needed. This way, the cost of the solar cells can be offset. As only direct sunlight can be effectively concentrated, the systems are mounted on a 2-axis tracker that follows the sun along the day. Commercial concentrator cells on germanium show efficiencies of around 36-38% at 500x concentration and systems using this technology have been deployed in the US, Europe, Asia and Australia. The ultimate goal of concentrator PV builders is to produce clean energy at a cost comparable to that of coal fired plants.



Caption 1: Concentrator PV system using lenses and solar cells originally designed for space applications. This system has a sunlight to AC conversion efficiency of over 22%, effectively double the performance of state-of-the-art Si based modules.

In order to support the expected growth of the terrestrial concentrator PV market and to a lesser extend the LED market, a new production capacity for germanium wafers is to be set up at Umicore's Quapaw site in Oklahoma, United States (figure 2). Construction has started in October and is scheduled to be completed in the spring of 2010. The facility will complement Umicore's existing production site in Olen, Belgium, effectively doubling the wafer production capacity to 900,000. Quapaw's location has the advantage of being close to the activity's sizeable customer base in the United States. The plant will be unique as it will be fully integrated, covering the flow sheet from ore over refined metal to crystal and finally to substrate. Waste streams will be recycled as much as possible, minimizing the amount of germanium needed per substrate.



Caption 2: Artist impression of the new germanium substrate wafer plant in the US.

Umicore's leadership in the space market positions us well to take significant market share in these emerging and exciting terrestrial markets. ■

NEWTEC WINS THE PRESTIGIOUS TECHNOLOGY INNOVATION AWARD 2008



Newtec participated for the first time at the Open Company Days. Over 2300 visitors had the opportunity to learn more about Newtec, the products and systems, which Newtec offers in the field of satellite communication.

The visitors could learn about the speed and performance of broadband internet access via satellite, TV on your mobile, video transmission via satellite, satellite television, TV+internet+telephone in your camping car or your boat, ... and about the passion and the business mind of the Newtec employees.



stances, in which terrestrial networks are not accessible or usable (e.g. in case of catastrophes or urgencies).

There was a.o. a demonstration of Sat3Play®, a system which makes broadband internet access possible through satellite and which is specifically consumer-oriented. Various Sat3Play® terminals (modem + antenna) were set up to give the visitors the opportunity to experience the speed and performance of internet via one of the SES ASTRA satellites.

Another live demonstration was Mobile TV or television on your mobile phone: some via satellite received TV channels were re-broadcasted through a terrestrial UHF frequency, which showed the visitors that TV on your mobile phone is no longer the future and is even of very high quality.

In various outside set ups of partners : Triple Play (TV; internet and telephone) via satellite (Sateliet Electronics), a DSNG-car (VRT), Outdoor Broadcasting (Alphacam) and mobile broadband via satellite (IPcopter) could be discovered.



Within the framework of Open Company Days this year again an award was granted by Open Company Days, the Flemish Community and Agoria, with as theme 'technological innovation'. Newtec was chosen to be the most technological innovative company amongst the participants of Open Company Days 2008 and received on September 30th the prestigious award from Patricia Ceysens, Flemish minister of Economy, Science, Innovation and Foreign Affairs, and Yves Lejaeghere, founder of Open Company Days. Newtec won this award for the development and commercialising of the Sat3Play® system.

Sat3Play® is a broadband internet access system providing an "always on" two-way broadband connection via satellite between the internet and the residential user. The principle can be compared with "ADSL via satellite". Because of the use of satellite link the system is for the end user completely independent of existing terrestrial network infrastructure, offering possibilities to provide broadband internet access in remote locations or in cir-

Unique for the Sat3Play® system is the very competitive price for the end-user: This is made possible by the low purchase cost of the equipment together

with a self-installation. Self-installing of this kind of application is innovative for the industry and unique of its kind. The monthly subscription cost for the consumer is comparable with terrestrial alternatives.

In countries like Germany, France or Italy it is not economically feasible for operators to guarantee terrestrial DSL or cable coverage and 10 upto 30% of the citizens are not able to get broadband internet access. Even in countries with high cable coverage like Belgium or The Netherlands there are places where users don't have access to broadband internet. In Europe the European Commission makes it a top priority to provide broadband internet to each EU- citizen. The big challenge for internet service providers is to offer 'DSL like' internet access at a competitive price in these remote places.

The Newtec Sat3Play® system meets this challenge and is commercialised by several Sat3Play customers, such as the ASTRA2Connect (www.astra2connect.com) service by SES Astra, the largest European satellite operator. This service is now sold through different Internet Service Providers (ISP) in more than 10 countries, such as Belgium, The Netherlands, Germany, France, Italy, Switzerland, Austria, Ireland, Poland and Slovenia.

The Sat3Play® system is developed for large service providers like telecommunication companies, internet service providers and broadband operators, who like to offer to their end users – residential clients or SME's – internet access at places where no terrestrial (broadband) internet access is available. ■

More information on www.newtec.eu



CMOSIS NV

CMOSIS NV is a young company, located in Antwerp, focussing on development, manufacture and sales of CMOS image sensors for professional, industrial and scientific applications, including space projects.

CMOSIS started in December 2007 and already succeeded in obtaining its first ESA project through a competitive call for proposals. This was only possible because this young company can rely on a lot of historical experience in this field. Out of the twelve employees, currently active at CMOSIS, at least nine have worked for the IMEC spin-off company FillFactory (now Cypress Semiconductor). Amongst these nine are three of the original founders of FillFactory. This way CMOSIS combines almost a 100 person-years of experience in the field of specification, design, test, characterization, manufacturing and commercialisation of CMOS image sensors.

CMOSIS develops new technologies based on CMOS processes which result in more performing pixels (light sensitive element) and image sensors. CMOSIS in particular concentrates on:

Pixels with high shutter efficiency:

Image sensors for machine vision and motion analysis need a so called global or synchronous shutter. This means that for all the pixels the integration time starts and stops at the same time. This avoids a possible transformation of a fast evaluating scene. Synchronous pixels store the image information in a capacitor before read-out of the image information. It is of essential importance that the integrity of this information is maintained between storage and the transfer to the output of the sensor. The highest risk is that the storage capacity itself is light sensitive. This is called parasitic light sensitivity. As the integration time typically is 100 times shorter than the longest storage time, this parasitic light sensitiveness can only be 0,1% for a useful image sensor. The pixels of CMOSIS have an extreme low parasitic light sensitiveness of 0,01% or less.

Fast and highly accurate ADC's

The demand for fast image sensors with digital outputs grows continuously. Digital outputs simplify the development and manufacturing of smaller and energy-efficient cameras. Here for CMOSIS develops on-chip ADC's, which can be optimized for speed, power consumption and accuracy.

Large image sensors: many pixels and/or large image sensor dimensions

Manufacturing image sensors with many pixels or very large dimensions at an acceptable price is a big challenge. In order to get a reasonable production yields so called 'killer defects' have to be avoided. Killer defects are defects in the image sensor, which make large parts of the sensor unusable so that the sensor has to be rejected. CMOSIS has developed methods reducing the sensitivity of a design for this type of defects significantly and thus increasing drastically the yield. Especially applications in medical imaging, 'high-end' digital photography and scientific applications, like astronomy, will benefit from it.

New pixels with high sensitivity and low cross talk

CMOSIS develops new pixel architectures characterized by the combination of high sensitivity and very low cross talk.

TDI CMOS image sensors

"Time Delayed Integration" or TDI image sensors are used to observe moving objects. By synchronising the transfer of the image information between pixels with the movement of the object, the effective exposure time is increased. This way pictures can be made with less light. Up to now good implementations of TDI were restricted to CCD image sensors, by adding charges on-chip.

Furthermore low noise readout in combination with a global shutter is required. CMOSIS has developed a number of new ways to solve this problem. Possible applications can be found in earth observation, machine vision and medical imaging.

These new techniques and inventions will allow CMOSIS to deal with future challenges in the field of imaging for space applications. CMOSIS works closely together with the most important users in this market segment. ■

More information on www.cmosis.com



SPACE TECHNOLOGY TRANSFER AT COMPOSITTRAILER



Compositrailer is a high technological SME, based in Lokeren, Belgium, which is specialised in dynamic loaded composite structures for which it has also developed its own production processes.

Composite structures are used increasingly in more complex forms in aerospace technology, road transport and wind turbines. Finite Element Analysis calculations of these structures are difficult to perform accurately because of the anisotropic structure of this type of materials. Different Finite Element Analysis (FEA) models show a good approach however, they can difficult handle non-linear structures. The only way is to adjust the model after every infinitesimal movement. This means that complicated calculations are needed and that complex structures always require time-consuming calculations. A specific problem is that sandwich panels, which are integrated in a composite structure, are even harder to calculate because of this. Usually they are calculated separately or with the help of the 'sandwich theory', which results in less accuracy. The problem increases in magnitude when sandwich panels are used in combination with a three-dimensional fibre structure. Next to the inaccurate sandwich calculations it is nearly impossible to calculate such structures perfectly.

Compositrailer in Lokeren, Belgium, has developed a panel with a three-dimensional fibre structure for its composite truck chassis. This panel is commercialised under the name Acrosoma®. Not only the product, but also the production process, has been developed in Lokeren by Compositrailer. The Acrosoma® production

process is a unique combination of Tufting and Pultrusion or a combination of a textile and composite technology. Because of the very difficult calculability of the Acrosoma panel on its own, let alone the calculability when it has been incorporated in a complex structure with a dynamic taxation, Compositrailer could, until now, do nothing more than build test products, try them and trust the derived empiric data that came from the tests.

ESA has had the program ESAComp® of the Finnish firm Componeering developed for various space technologies, specifically for the calculation of three-dimensional composite structures. A cooperation between Componeering and Compositrailer around the ESA Technology Transfer Program, has led to a calculation method for the Acrosoma® panel based on the program ESAComp®, which has been developed for ESA.

This calculation method reaches results very quickly, which avoids many time-consuming methods. With the help of a couple of test constructions, it showed that the calculated tension and reformations correspond to the real measurements for 100%. Because of this, the calculation method was able to be validated.

Thanks to the successful Technology Transfer Project, Compositrailer is now able to attract more manpower for its engineering department and it has recently switched to its own CATIA-, ABAQUS-, and ESAComp® workstations with integration of the developed calculation method. All this is now used for the existing Compositrailer trailer constructions, wind turbine blades and in a A350 R&D program. ■

