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**THE ORIGINAL  
CS INDUSTRY  
NEWSPAPER**

May 6,  
2006

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**The McDonald Report  
Commentary & Perspective...**

## Foxes Prefer the Lights Be Less Bright

March 1, 2006...Does the brightness of our compound semi (CS) and solid state lighting (SSL) industries' blue LED indicator lights on computers and on the little black or gray boxes strewn around your home office ever bother you at night? Do you find yourself putting duct tape over them so you don't feel like they're doing something they shouldn't be when they're supposed to be "resting?" Do those intense violet/white LEDs in "modern" decorative and architectural lighting make you feel like a fox caught in an auto's headlights on a country highway? High brightness LEDs have their obvious and very applaudable applications, but what about the softer, more subtle blue and white lights? Who's producing those... and how are they doing it? And who's making a serious attempt at commercializing UV LEDs these days?

I really liked the original blue LEDs made in pre-GaN days. I saw them first

## Wafer Technology Shares Award to Develop New InP Based Thermophotovoltaic Devices

March 1, 2006...Wafer Technology Ltd. of Bucks, UK a wholly owned subsidiary of IQE plc of Cardiff, will partner with the Centre for Integrated Photonics and Oxford University to develop high efficiency thermophotovoltaic (TPV) cell technology based on indium phosphide (InP) substrate material. Wafer Tech was awarded funding for three years of the project from DTI and EPSRC through the Technology Programme. As part of the project, Wafer Tech will be responsible for developing a range of new, low cost InP substrate technologies. CIP will perform epitaxial growth, device fabrication and testing, and the University of Oxford will engage in cell design and the fabrication of fully packaged TPV modules. [Company News Release](#)

## The Fox Group Delivers 15mm Epi-ready AlN Substrates

Jo Ann McDonald, founding editor

March 1, 2006...A North American-based vertical supplier of GaN LEDs and wide bandgap (WBG) substrates called [The Fox Group](#) has emerged from five years of relative quiet to officially announce that they're now delivering 15mm epi-ready aluminum nitride (AlN) substrates. Officially incorporated in Piedmont, California, with the substrate work being done in Deer Park, New York and the LED manufacturing in Montreal, Canada, The Fox Group is now officially on everyone's radar screen. According to the [company news release](#), The Fox Group's monocrystalline AlN substrates disks are sliced from boules grown by a proprietary, modified vapor transport, "true-bulk crystal growth process" based on the company's core USA patents, that the company underscores are for their robust, reusable crucibles for high-temp, crystal growth. Those patent numbers and links to the full patent are

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in elevators. Nice color. Soft. Subtle. They helped make you patient, which comes in handy when in an elevator. Everything seems to have gone high intensity lately (including the business scene), with an emphasis on squeezing as much of the light out of the die as possible while eliminating most of the profit on the other end, transferring even more squeeze onto the suppliers. And there doesn't seem to be nearly as much focus on UV LEDs as I thought there'd be by this time. Perhaps if there'd been more production of more subtle blue, white and efficient UV LEDs, the market revenue numbers might still be in double digits. We'd also have more of those gentle blues and whites warming our nights, and more UV LEDs fielded into medical, curing, and purification applications.

On the occasion of the release of news that their 15mm epi-ready AlN substrates are on the market (ref: [March 1, 2006 coverage](#)), I had the pleasure of getting to know [The Fox Group](#) better. They're obviously really into aluminum. In addition to their new aluminum nitride (AlN) substrates, which are moving out of their Deer Park, New York doors in the USA, The Fox Group has AlGaIn-based emitters in production in their Canadian facility. These are then being packaged in Asia. Seems that, if you want to make your blue spectrum LEDs really bright, you use indium (In) and you grow them, exacting layer by careful layer, in MOCVD reactors. If you want to make them less expensively and grow the die faster... and you're after color consistency rather than brightness, you turn to the method called HVPE. Principals from The Fox Group and Technologies and Devices International Inc. (TDI) in Silver Springs, Maryland USA wrote a paper about the HVPE process, which TDI licenses to The Fox Group, back in Dec. of 2004 for IOP's CS magazine. You can access it online under the title: [HVPE offers alternative route to AlGaIn-based UV emitters](#). Note the heavy-hitting author names of: TDI's Vladimir Dmitriev and Alexander Usikov, and Heikki Helava and Barney O'Meara of The Fox Group.

While The Fox Group has been putting their R&D team to work for five long

[6,547,877](#) (tantalum) and [6,537,371](#) (niobium).

As one can see by reading those patents, The Fox Group has been closely aligned with outstanding and well-known Russian wide bandgap (WBG) specialists in St. Petersburg. Co-founder and CTO of The Fox Group is Heikki Helava, who divides his time between Deer Park, New York, the California HQ and Montreal. The company got its start five years ago with incentives from the Quebec government. CEO of The Fox Group is Barney O'Meara, who spends the majority of his time in the Canadian facility. Prior to joining The Fox Group, O'Meara worked with Russian technologists for 20 years in East to West tech transfer, thus the ties with the company's Russian partners, a group headed by Yury Alexandrovich Vodakov. According to Mr. O'Meara, "*We've put together an especially strong IP portfolio with nine US patents awarded to date, the key ones being our tantalum and niobium patents*" (cited and linked to, above).

In a conversation with Barney O'Meara and Bob Tobin, Fox's new director of sales & marketing, development of the company's blue (460nm) and UV LED work currently underway in Montreal was also discussed. They are producing blue LEDs of excellent color consistency and color stability, which is desired for indoor use, and also producing UV LEDs in the 350-365nm range. More details about the company and their LED work can be found in our *March 1st McDonald Report* editorial. In that conversation, Bob Tobin underscored that "*target applications for their AlGaIn LEDs are for indoor signs, displays, and indicator lamps and that company is very interested in working strategically with companies anxious to optimize The Fox Group's UV products for medical, curing and purification applications.*" Bob Tobin, who was formerly with AXT and Aixtron can be reached in California at tel: +1 925-980-5645 and email: [sales@thefoxgroupinc.com](mailto:sales@thefoxgroupinc.com). Their website is undergoing a major overhaul and you'll undoubtedly be hearing a lot more from them, so stay tuned to [www.thefoxgroupinc.com](http://www.thefoxgroupinc.com).

## DMG and Svedice to Form Partnership

March 1, 2006...DMG Technologies and Svedice announced the formation of a strategic partnership. According to DMG, the agreement will allow them to incorporate Svedice-designed products into their own optical subassemblies. Additionally DMG will distribute Svedice products in North America. DMG, located in Monterey Park, California USA, is a manufacturer of optical sub assemblies for datacom, telecom, CATV, and instrument systems.

Svedice of Järfälla, Sweden, provides customized InP-based semiconductor processing and design services. Their products include: 1310 nm and 1550 nm lasers, as well as PIN- and APD- (avalanche photodiode) receivers for 2.5 Gbps and 10 Gbps applications. Svedice offers wafer and chip-on-carrier-processing, III-V epitaxial growth, materials characterization, e-beam-lithography, etching, metallization, and testing. [DMG News Release](#)

## Avago Technology's LNA Module Named a 2005 Product of the Year by AnalogZone

March 1, 2006...AnalogZone has named Avago Technology's ALM-1106 ultra-low-noise amplifier



years, they only recently came on my radar screen. Typical of teams spread over various physical locations, they've been doing excellent, creative R&D, but they weren't really very proactive... until now. Then again, when you're in R&D mode for longer than you may have originally anticipated, it's not a bad idea to stay "below the radar" until you're actually shipping products. The Fox Group was cofounded by Heikki Helava, who serves now as CTO. Many of you may know Heikki from his years at AXT in the 1990s. He's a great technologist, writer, and cheerleader for all things nitride related.

Not only is Fox licensing the LED growth technology from Vladimir Dmitriev's group at TDI, but Fox also has other outstanding Russians on their strategic team who originally hailed from Ioffe Institute. Vladimir was one of the original three group leaders at Ioffe, and his team became Cree's Eastern European division before forming TDI. Note that the names, headed by Yury Alexandrovich Vodakov, are listed on the key USA patents cited in the [March 1, 2006 coverage](#). What I like best about Fox's approach to blue LEDs is that they're not competing with the big guns who are going after the usual SSL holy grails. They're focusing on the not-so-bright blues and are setting their sights towards the mainstream UV-LED applications, using what they feel is a practical, aluminum-based production method.

HVPE, as championed for years by TDI, stands for Hydride Vapor Phase Epitaxy. Like MOCVD, it sometimes goes by other names (in the case of MOCVD, "OMVPE" and "MOVPE" are also used). HVPE is sometimes called Chloride Hydride Vapor Phase Epitaxy. It's a mature, low-cost epitaxial technique that uses HCl (hydrogen chloride) gas flowing over hot Group III metals to form metal chlorides. The metal chlorides react with Group V metal hydrides to form III-V compounds. In the case of GaN (gallium nitride) the "metal" hydride is NH<sub>3</sub> (ammonia). I'm told HVPE isn't as precisely controllable as MOCVD, but when you're not going for the high brightness, MOCVD isn't all that

(LNA) module used for enhancing performance in GPS handsets, a 2005 Product of the Year. According to Avago, analogZone gives awards for product design, performance, likely contribution to the field of analog engineering, and anticipated market success. Avago says that the ALM-1105 offers lower noise and increased sensitivity compared to other models. The device also boasts low-voltage operation, low device current, and battery-saving features such as integrated shutdown capability makes the amplifier module an ideal choice for GPS. [Company News Release](#)

## Skyworks to Leverage New BiFET Technology

*March 1, 2006...* Skyworks solutions of Woburn, Massachusetts USA, a RF solutions maker, announced that it will leverage bipolar field effect transistor (BiFET) process technology for its gallium arsenide (GaAs)-based products. Skywork's BiFETs integrate indium gallium phosphide (InGaP)-based heterojunction bipolar transistors (HBTs) with field effect transistors (FETs) on the same GaAs substrate.

The company says that adding FETs to a high yielding InGaP/GaAs HBT process enables the embedding of advanced bias control features in the same power amplifier (PA) die. The company says that the embedding eliminates the need for external bias control systems for many applications. The company also says that adding it to its other proprietary technology can extend battery life and reduce the radio frequency (RF) loss between integrated components. [Company News Release](#)

## Avago Introduces Digital CMOS Color Sensor

*February 28, 2006...* Avago Technologies introduced a digital color sensor with a two wire serial interface. The company reports that the 2.6 volt, CMOS color sensor is ideal for mobile phones, MP3 players, PDAs, and portable medical equipment. According to the company, the new color sensor comes in a 20-pin QFN (quad flat no lead) package. It measures 5 mm x 5 mm x 0.75 mm and is according to the company, 50 percent thinner than the closest competitor. Avago also said that the device operates from a 2.6 V supply voltage, providing significantly lower power consumption. The company indicated that the ADJD-S313-QR999 can be used in conjunction with a white LED for reflective color measurement. [Company News Release](#)

## AXT Achieves International ISO 14001:2004 Certification

*February 28, 2006...* AXT announced that it has achieved the international ISO 14001:2004, Environmental Management Standard. An ANSI accredited third party auditor recently conducted an audit of the company's Beijing facility and environmental policies. As a result of the audit, ISO 14001 certification has been granted. According to the company, ISO 14001:2004 is the internationally recognized standard for environmental management systems. It provides guidance on how to manage the environmental aspects of an organization's activities, products and services more effectively, while taking into consideration environmental protection, pollution prevention, and socioeconomic needs. [Company News Release](#)

## Hsinchu Science Park Growth Slows for 2005

CompoundSemi News Staff

necessary. What you get with HVPE, according to the experts, is excellent color consistency and color stability. Vladimir gave a presentation of the process at one of our [101 workshops](#), which is still [available on video](#).

The Fox Group's key is in the use of aluminum instead of indium, and according to Fox, aluminum is what gets you to UV's desired wavelengths of 350 to 365nm. I wrote about the UV opportunities in a *McD Report* last March, titled "[Water Water Everywhere](#)" following an inspiring presentation by GE's Michael Sutsko at our *Wide Bandgap Business Opportunities Workshop* in December at CS Outlook (the precursor to [CS Vision](#), which we'll be holding in April 27/28 2006 in Vancouver BC). I encourage you to re-read [Water Water Everywhere](#) where you can learn more about this promising field. And then, like The Fox Group, give me a call and let me know if your team is climbing on the not-so-bright blue and/or the UV LED bandwagon.

*If you have questions about the solid state lighting and compound semiconductor industries or have news or views to share, I'm Jo Ann McDonald, Editor of LIGHTimes and CompoundSemi News. Feel free to contact me directly, anytime. [JoMac@CompoundSemi.com](mailto:JoMac@CompoundSemi.com) My direct tel at the ranch is +1-325-463-5345*

*February 28, 2006...*The previously exploding revenues of Hsinchu Science Park in Hsinchu, Taiwan, have slowed. The nearly four hundred companies calling the Hsinchu Science park, home have had a 7 percent overall decrease in revenue for the year, according to a *Digitimes* [article](#). The total revenue fell to NT\$985.5 billion (US\$30.42 billion) for 2005, according to *Digitimes*. The export value of the products manufactured in the Taiwan park decreased by 0.3 percent for the year, and the import value dropped 14.8 percent to NT\$334.8 billion (US\$10.33 billion), the article indicated. Integrated circuit revenue for the park was down 7 percent. Optoelectronic revenue was up 5 percent for the year however. *Digitimes* reported that currently about 114,846 people work in the science park. The total revenue for 2006 for the park is expected to get back on track with explosive growth of nearly double in 2006.

## **Intematix Licenses Phosphor Technology to Kingbright; Kingbright Adds to Cree Patent License**

Scott McMahan

*February 28, 2006...*Kingbright, a Taiwan-based maker of LEDs has now licensed Intematix's phosphor technology and has added it to the white LED formula patent they recently licensed from from Cree. (Ref: [Coverage](#)). Kingbright, a maker of discrete LEDs and LED components, can now reportedly produce non-infringing white LEDs in safe waters away from the great white shark, Nichia. Wen Joe Song, Kingbright president and CEO, said of their recent agreement with Cree, "*Our target market includes major U.S. and multi-national companies for which avoiding intellectual property disputes is critical.*" Speaking of the Intematix license agreement he said, "*We have integrated our own unique packaging technologies with CREE chips and Intematix phosphor to deliver the optimal performance, as well as the best value, into the competitive global marketplace.*"

Kingbright's newly licensed, Intematix phosphors include the White Lightning NY450/ NY460 product line which Intematix recently expanded to include warm white. Kingbright has licensed Cree technology for years, but just recently licensed their white LED technology. (Ref: [Coverage](#)). Other companies around the world have delved headlong into relatively clear but shark infested white LED patent waters. The ones who weren't careful were bitten with sharp patent lawsuits. While Cree, Osram, and Nichia are on the lookout for patent infringement in the white LED realm, Nichia remains the great white shark, "Jaws", since it is the most vigilant and dangerous of the three. [SecondPage members can see the extended version of the article](#). *Scott Mc.*

**We are always looking forward to hearing from you.  
Contact the news editor, Scott McMahan, with an email to  
[Editor - at - CompoundSemi.com](mailto:Editor - at - CompoundSemi.com) or call +1 (512) 219-0158**

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## CIF-SSL 2006

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July 12-14, 2006

Shenzhen, China



One of the only 3 solid state lighting events you need to have on your calendar each year along with PennWell's Strategies in Light and Solid State Lighting Net-LIGHTimes SSLs/Blue. This rapidly growing event is organized and sanctioned by the China National Committee on Solid State Lighting, drawing notable speakers and exhibitors to the fastest growing SSL-adopting economy in the world. SSL is a national priority in China, so this is a high-profile event that will help you set your business apart and show you where you need to be to capture your slice of this enormous opportunity. Make the connections that will make a difference. Visit [www.China-SSL.org](http://www.China-SSL.org) for details, registration and sponsorship information.

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