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## “Non substrate applications account for 25% of the US\$1 billion sapphire industry,” says Yole Développement

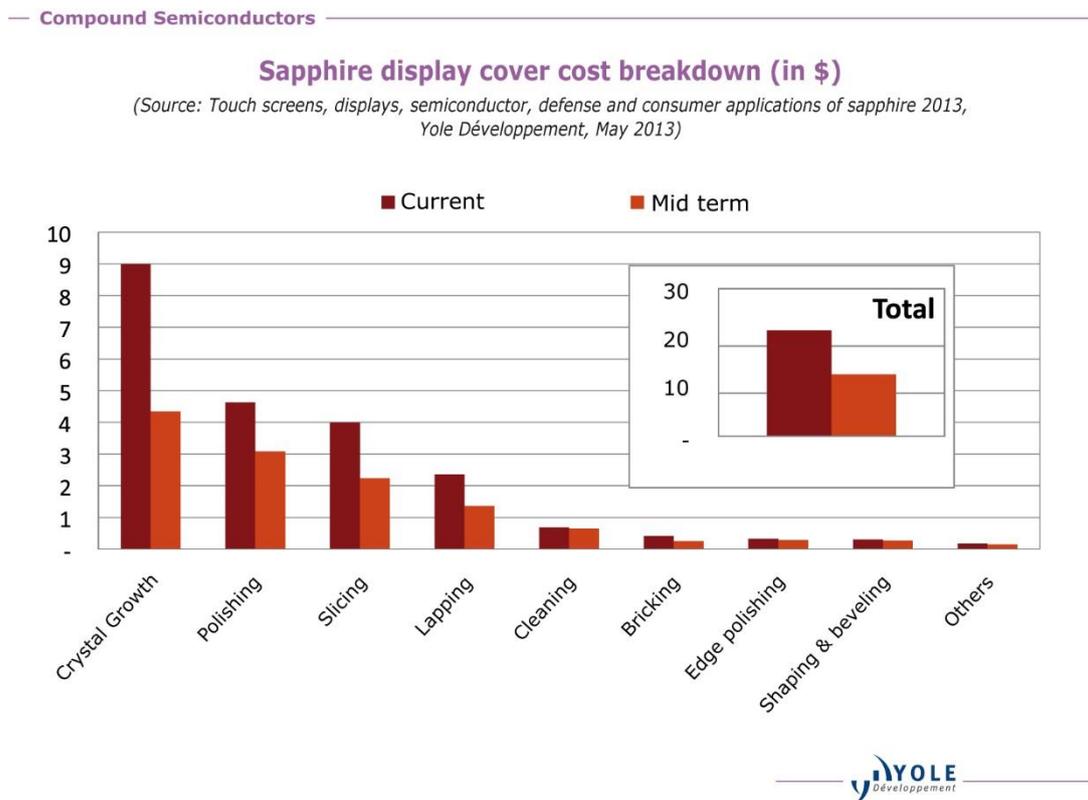
«Sapphire applications - Touch screens, displays, semiconductor, defense and consumer applications of sapphire 2013», a new report from Yole Développement

Lyon, France – June 10, 2013: Yole Développement announces its **Sapphire applications - Touch screens, displays, semiconductor, defense and consumer applications of sapphire 2013** report. Yole Développement’s report provides a complete analysis of 6 main applications, related volume and revenue forecast, challenges, key players and supply chain. It also focuses on emerging opportunities.

### Display cover applications could more than triple the size of the industry within the next 5 years

Established applications could generate US\$366 million in 2018. But adoption of sapphire for smartphone display covers could generate an additional \$1.3 to \$2.6 billion depending on the adoption scenario.

Sapphire is currently used in some exotic, luxury phones. However the sapphire price reduction combined with the massive adoption of touch screen in smartphones have stimulated the interest of cell phone OEMS for this material. Crystal growth equipment manufacturer GTAT is leading the charge and recently created a lot of buzz around this application and on the OEM front. Apple is rumored to have conducted an extended due diligence.



Adoption of sapphire in mobile display covers represents the single largest opportunity discussed in this report. It remains, however, uncertain. Yole Développement sees 4 major challenges: technology,

supply chain, cost and market acceptance. Crystal growth and finishing technologies still need to be optimized in order to guarantee stable performance and reduce the price gap with chemically strengthened glass like Corning's Gorilla. Yole Développement's analyst estimates that the current cost of manufacturing a sapphire display cover is around \$22 but could drop to \$12 and ultimately below \$10. It remains to be seen if the Bill Of Material increase vs. the \$3 glass display cover will be absorbed by the OEM in exchange for increased market share or if the consumer will value the increased durability brought in by the sapphire cover and accept paying a premium.

It is difficult to predict the success of sapphire in this application. However, Yole Développement expects that some OEMs will probe the market and introduce some models featuring sapphire by late 2013 - early 2014. Initial customer reaction will have a strong influence on the future of the technology. If successful, strong market traction could ease the funding for the more than \$1.5 billion in capex needed to serve this industry and set up the supply chain to serve this application.

Glass cover lens manufacturers might seize the opportunity. Because of their vast existing glass finishing capacity that could be converted to process sapphire and their privileged access to leading smartphone OEMs, those companies could beat established sapphire finishing companies into this market. However, another scenario would see collaborations between some leading sapphire and cover lens makers in order to pool technical knowledge, capacity and customer access under the push of some smartphone OEMs.

In any case, if this opportunity materializes, it will transform the sapphire industry with new players emerging, and overall production capacity increasing by a factor of more than 7x.

### **Defense semiconductor and other applications represent 25% of the sapphire industry revenue**

*"These applications will bring in revenue of \$240 M in 2013 and, excluding the display cover opportunity, will increase at a 9% CAGR to US\$366 million in 2018. Watch windows are currently the single largest application with revenue of US\$120 million in 2012. Most applications are fairly mature with relatively low growth opportunity with the exception of the emerging mobile device camera lens cover and the aerospace market, driven by the F-35 jet fighter program and the emergence of sapphire based transparent armors,"* explains Eric Virey, Senior Analyst, Compound Semiconductors, at Yole Développement.

Most applications have their own "eco-systems" with preferred material vendors, finishing companies, growth technologies and barrier of entrance. The defense market for example is characterized by strong technical barriers in both growth and finishing, combined with export restrictions and national preferences. The semiconductor market is also fairly concentrated with two companies, Saint-Gobain Crystals and Gavish which both hold the bulk of the market due to their technology for growing the large sapphire tubes used in many plasma tools. However, competition is increasing on simpler parts like viewports and lift pins.

### **Industry transformation could open the door for new applications**

Driven by the promise of large volumes for the LED industry, sapphire crystal growth and manufacturing capacity has increased by more than 8x in the last 5 years. In just the last two years, more than 80 companies have announced their intention to enter the industry, bringing the potential number of players to 130+ with more than 50 of these potential new entrants located in China.

The entrance of aggressive new players with large idle capacity is likely to challenge established players in many applications. Yole Développement expects those players to initially enter domestic and international markets with low barrier of entrance and later expand their reach as their technology matures.

Excess capacity and increased competition have created a challenging environment for sapphire makers. However, they also drove prices down dramatically and stimulated technology improvements to further reduce cost and improve capability (crystal sizes, shapes ...). Yole

Développement expects that ultimately, this will be favorable for the industry: lower price and improved crystal growth and finishing capabilities will open the door to a large gamut of new applications where sapphire has been considered for its performance but never adopted because of its cost.

### About Sapphire applications - Touch screens, displays, semiconductor, defense and consumer applications of sapphire 2013 report:

- **Author:**

**Eric Virey** holds a Ph-D in Optoelectronics from the national Polytechnic Institute of Grenoble. In the last 12 years, he's held various R&D, engineering, manufacturing and marketing positions with Saint-Gobain. Most recently, he was Market Manager at Saint-Gobain Crystals, in charge of Sapphire and Optoelectronic products.

- **Catalogue price:**

Euros 5,990.00 (Multi user license) - Publication date: May 2013.

For special offers and the price in dollars, please contact David Jourdan (jourdan@yole.fr or +33 472 83 01 90).

- **Companies cited in the report:**

3M, 613 Institute of Aviation Industry Corporation of China, AB Saphir, Advanced Energy, Aesir Copenhagen, Airbus, ALPS, AMEC, Apex, Apple, Applied Materials, Applied Sapphire, ARC Energy, ARC Laser, Aries Industries, Armorline, Asahi, ASM, Astronic, Audemars Piguet, Aviation Industry Corporation of China (AVIC), Axelis, BAE, Battelle, BIEL, BIEL Crystal, Blackberry, Blosch, Boeing, Bombardier, BrahMos, Breitling, Cando, Canopy Design Bureau, CAT, China National Precision Machinery Import and Export, Chopard, Cidra Precision Services, Cirrus, CMC Electronis, Comadur, Coorstek, Corning, Crystaland, Crystalwise, Crytur, Daedalus Innovation, Dai Ichi, Giken, Dassault Falcon, Datalogic, Denel Dynamics, Diamonex, Digitech Systems, Djeva, EBEL, ECW EELY, Elbit systems, Emerging Material Technology, Emerson Process Management, Ensco, Esterline, Everbright Optics, Exotic Electro Optic, Fedex, First Star Panel, Flextronics, Foxconn, Fujitsu, Fukuda Labs, G Tech Optoelectronic, Gavish, Girard Perregaux, Gresso, GTAT, G-Tech Optoelectronics, Guild Optical, Gulfstream, Hanns Touch, Hansol, Hitachi, Honeywell, HTC, Huawei, ICD LIG, II-VI Inc, Iljin, Iljin display, Impex, Insaco, Integra Life Science, Israel Aerospace Industry, ITT Defense and Information, JadeZone, Jaeger LeCoultre, Jarvis Optic, J-touch, Jtouch, Jusung Engineering, KBM, Kollsman, Korund, Kurt Lesker Company, Kyocera, LAM Research, Lammbos, LBGK (Laibao Hi Technology, Lenovo, Lens (one) Technology, Lens Technology, Lexavia, LG, LightWork Optical Systems, Lockheed Martin, Longines, LORD Corporation, Luminous Optical Technology, Master Meter, Mattson Technology, Max Levy Autograph, MBDA, Melfas, Meller Optics, MER Corporation, Metrologic, Meyer Burger, MKS, Mobiado, Monocrystal, Montavon, Moreens, Morgan Advanced Ceramics, Motorola, Motorola Mobility, MPI, Namiki, Naval Research Laboratory, Nippon Electric Glass, Nissha Printing, Nokia, Norinco, Northrop Gruman, Novel Optic, Nudelman, Ocular, Omega, Opto, Panjit, Patek Philippe, Pegatron, Precision Sapphire Technology (PST), Proware, Pryroda, PSC, PSK, Rafael Defense systems, Rayotek, Raytheon, Rockwell Collins, Rolex, Rotem, RSA, Rubicon, Saab Avitronics, Saifei Sapphire, Saint-Gobain, Samsung, Sapphire Technology, Sapphy, Schott, Seamark International, Sebal, SELEX Galileo, Sevenstar, SFA, Shangcheng, Shenzhen Goodfeel Technology, Shibura, Shinkosha, Silian, S-Mac, SMK, Sony, Space and Missile Defense Command, Star Dentech, Stettler Sapphire, Surmet, Suzhou Crystal Element, Swatch Group, Swenc (Hanghao Tech), Swiss Jewel, Symbol, TAG Heuer, Technology Assessment and Transfer Inc, Tera Xtal, Thales, The china & South Optical Crystal, Thermal Technology, Tokyo Electron, Tonino Lamborghini, Touch International, TPK, TPK, Truly, Twin Creeks, Tydex, Ulvac, Ulysse Nardin, University of Rochester's Center for Optics Manufacturing, Ural Optical and Mechanical Plant (UOMZ), Vitalic Industry, Vympel, Wincor Nixdorf, Wintek, Wintek, Xgear, Xingxing Firststar Panel Tech, YAC, Young Fast, Yu Shun ("Success Electronic"), Zafirro, Zebex, ZTE.

## About Yole Développement – [www.yole.fr](http://www.yole.fr)

Founded in 1998, Yole Développement has grown to become a group of companies providing marketing, technology and strategy consulting, media in addition to corporate finance services. With a strong focus on emerging applications using silicon and/or micro manufacturing, Yole Développement group has expanded to include more than 50 associates worldwide covering MEMS, Compound Semiconductors, LED, Image Sensors, Optoelectronics, Microfluidics & Medical, Photovoltaics, Advanced Packaging, Nanomaterials and Power Electronics. The group supports industrial companies, investors and R&D organizations worldwide to help them understand markets and follow technology trends to develop their business.

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- Online disruptive technologies website: [www.i-micronews.com](http://www.i-micronews.com)
- Editorial webcasts program
- Six magazines: Micronews - MEMS Trends – 3D Packaging – iLED – Power Dev' - New in 2013: Image Sensors Industry
- Communication & Webcasts services

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