

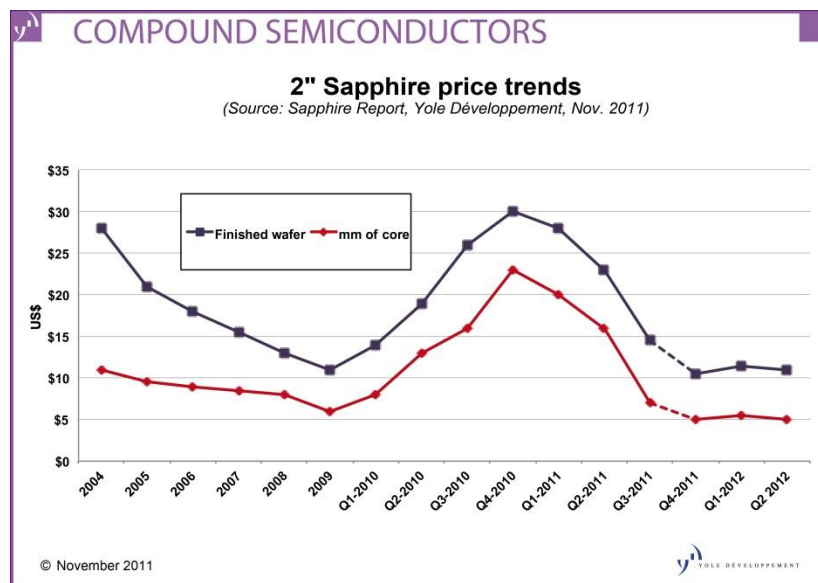
Sapphire market: supply and demand back in check” announces Yole Développement

“Sapphire Market”, A report from Yole Développement

Lyon, France – Nov. 2nd 2011 – Yole Développement announces its report **“Sapphire Market”**. “Our extensive tracking of the Sapphire industry on a daily-basis, allows us to provide a complete analysis of the sapphire substrates industry along with key market metrics”, explains Eric Virey at Yole Développement.

This report provides updated volume and \$ forecast for finished wafers and material through 2020 along with capacity analysis, price trends and new company profiles. In addition, an extensive review of the raw material and crystal growth equipment suppliers is provided, offering the most complete view of the Sapphire wafer industry available to date.

Supply and demand back in check



Following the massive material shortage in 2010, sapphire material and finished wafer prices remained high through early 2011. The situation was aggravated as wafer and LED manufacturers preparing for a massive intake of LED in the LCD TV market started building up sapphire inventory for fear that supply might remain short. But a softer than expected LED TV market and an increasing sapphire capacity coming from established vendors worked together to rapidly bring supply and demand back into balance this summer. This has triggered a fast drop in wafer prices that have now returned to their pre-shortage

levels. While sapphire demand will pick up in late 2011 and early 2012, additional capacity from new entrants is expected to enter the supply chain and keep 2" prices at their historical lows for the foreseeable future. *"Yole Développement forecasts this low pricing to keep on running for the next coming months"*, says Eric Virey.

Few new entrants will succeed

Coupled with significant volume growth, the sapphire material shortage experienced through 2010 and early 2011 have created a window of opportunity for new entrants. In the last 18 months, more than 50 companies have announced their intention to enter the industry and would bring the total number of potential participants in this market to close to 100. More than 40 of those new entrants are located in China. Looking at midterm, adding up the capacity plans announced by those newcomers leads to a figure corresponding to almost 3x actual demand, a situation unlikely to actually materialize.

Most of the new entrants have little to no prior experience in sapphire crystal growth and wafer manufacturing. While the availability of "turn-key solutions" from various growth equipment suppliers has lowered the barrier to entry, reaching and sustaining high quality and high yields in sapphire crystal growth still requires significant expertise. The learning curve can be steep for newcomers to reach yield levels on par with established tier one manufacturers. Wafer finishing also requires unique expertise and could prove challenging for companies with no prior experience. Beyond wire saw manufacturers offering efficient slicing solutions and process, not turnkey solution are available for wafer finishing.

The 2010 pricing environment was very forgiving and allowed some new entrants to achieve comfortable margins despite low yields and subpar technology. Yole Développement calculated that many of those new companies have production cost in the \$6-\$10 / mm of 2" core and will therefore lose money at the current market price. At the same time, established vendors with higher yields, large volumes and a more favorable product mix including large diameter wafers can achieve production cost <\$5 that will allow them to maintain positive margins and weather the storm. Midterm, Yole Développement expects that this situation will weed out the weakest players and trigger the withdrawal of many potential new entrants.

"The sapphire substrate industry, driven by LED applications, was initially developed based on a 2" diameter platform. Companies like Lumileds and Nichia were the first to move to 3" around 2003 while Osram pioneered the adoption of 4" shortly after. Due to the large concentration of MOCVD capacity in Taiwan, and the current ramp in China, 2" is expected to remain the dominant platform through 2012", explained Eric Virey.

But many established Taiwan based epitaxy companies are transitioning from 2" to 4" while some technology leaders in Korea, the United states and Europe have already made great strides in the their 6" conversion. Long term, a question mark remains regarding the

economics of 8". But R&D has already started and Yole Développement believes that recent improvements in sapphire growth and slicing technologies could enable a cost of ownership that in time will be compatible with the adoption of the platform.

About Sapphire report:

- **Author :**

Eric Virey, Ph.D. 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 position with Saint-Gobain. Most recently, he was Market Manager at Saint-Gobain Crystals, in charge of Sapphire substrates and materials for optical telecoms.

- **Catalogue price:** Euros 3,990.00 (single user license) - Publication date: Nov. 2011. 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:**

Sapphire makers (more than 100 companies with current and planned capacities):

Almecs, Alpha Crystal Technology , BIEMT, Blue Optical, Changzhi Hongyuan Technology Crystal Co, Ltd, Crystal Applied Technology, DC Wafers, DJ laser, ECEC (ZheJiang East Crystal Electronic Co), GCL, GT Solar, Haotian Optoelectronics Technology Co, Harbin Gongda (Aurora Sapphire), Heifei Crystalbridge , Optoelectronic Materials, Iljin Display, Jiaozuo City Crystal Photoelectric, KCC, Kyocera, Lan Yu, Monocrystal, Namiki, NCB Network, Neosemitech, NGC China Transmission, OCI, Darewin Opto, Rubicon, Rybinsk Crystals, Saint-Gobain, San Chih Semiconductor, Sapphire Materials, Sapphire Tech, SAS, Shinkosha, Silian, Siltron / LG, Sumitomo Metal Mining, Swiss Wafers AG, Tera Xtal, Union Light technology, USI Opto (Acme Corporation), Wafer Works, Zhenjiang Huantai Silicon Science and Technology...etc...

Crystal growth equipment makers (more than 20 companies):

Apeks, Arc energy, Crystal Tech, Dai Ichi Giken, GT Solar, Omega, Pryroda Engineering, Thermal Technology...etc...

Raw material suppliers (more than 20 companies):

Haemaroo, KC Corporation, Sasol/Ceralox, EMT, RSA Le Rubis, Spolchemis, Baikowski, Comadur, Nippon Light Metal, Sumitomo, Taimei Chemical, Zibo Xinmeiyu, Heibei Pengda Advanced Material, Suzhou Crystal...etc

About Yole Développement – www.yole.fr

Beginning in 1998 with Yole Développement, we have grown to become a group of companies providing market research, technology analysis, strategy consulting, media in addition to finance services. With a solid focus on emerging applications using silicon and/or micro manufacturing Yole Développement group has expanded to include more than 40 associates worldwide covering MEMS, Microfluidics & Medical, Advanced Packaging, Compound Semiconductors, Power Electronics, LED, and Photovoltaic. The group supports companies, investors and R&D organizations worldwide to help them understand markets and follow

technology trends to develop their business.

CUSTOM STUDIES

- Market data, market research and marketing analysis
- Technology analysis
- Reverse engineering and reverse costing
- Strategy consulting
- Corporate Finance Advisory (M&A and fund raising)

MEDIA

- Critical news, Bi-weekly: Micronews, the magazine
- In-depth analysis & Quarterly Technology Magazines: MEMS Trends– 3D Packaging – PV Manufacturing – iLED – Power Dev¹
- Online disruptive technologies website: www.i-micronews.com
- Exclusive Webcasts
- Live event with Market Briefings

TECHNOLOGY & MARKET REPORTS

- Collection of reports
- Players & market databases
- Manufacturing cost simulation tools
- Component reverse engineering & costing analysis

More information on www.yole.fr

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