For Immediate Release:

“Wafer Bonding will be a Key Enabling Technology for Advanced Semiconductor Manufacturing”

Permanent wafer bonding report

Lyon, France – May 19, 2011 – Yole Développement announces the publication of its technology study and market research report, Permanent wafer bonding report. Historically developed for MEMS & SOI substrates, the wafer bonding technology is today becoming a key processing technology for a wide range of applications: MEMS, CMOS Image Sensors, LEDs, Power Devices, RF and Advanced Packaging.

The wafer bonding market is a very complex one crossing different wafer sizes (from 2” to 12”), different applications (Advanced Substrates such as SOI, MEMS, LEDs, CMOS Image Sensors, Power Devices, RF Devices & Advanced Packaging) and different bonding technologies (Adhesive, Anodic, Fusion, Direct Oxide, Eutectic, Glass Frit, Metal Diffusion).

Yole Développement’s report aims at giving a vision, crossing what the wafer bonding technologies will be over the 2010-2016 time line.

Market Trends

Wafer bonding is usually defined as a process that temporarily or permanently joins two wafers or substrates using a suitable process. Historically developed for MEMS and then SOI wafers, wafer bonding technology has shifted to non-mainstream IC applications over the last years. Our report aims at analyzing the market perspectives and technical trends for permanent bonding.

“MEMS has been the first application where wafer bonder have been massively used (the wafer bonding step is mostly used to protect the MEMS sensitive element). And CMOS Image Sensors is also a very promising application for wafer bonder.\textsuperscript{1}, explained Dr Eric Mounier, Project Manager at Yole Développement. Indeed, up to two different wafer bonding steps can be necessary for next-generation CMOS Image Sensors: one for Back-Side Illumination and the second for WLCSP.

But besides MEMS and CIS, wafer bonder can be also used for LEDs or Power Devices. Indeed, in a typical LED active region, spontaneous emission scatters photons in all directions. If the substrate material has a smaller band gap than the active region, approximately half of the light is absorbed in the substrate; significantly reducing device performance. So, one of the manufacturing solutions for photon loss involves bonding a wafer containing an array of devices to another wafer that provides both a reflective surface for maximum light extraction and a heat sink for thermal management. And of course, over the 5 past years, much attention has been given to this technology for 3D integration of memories for example.

Technology Trends

For MEMS, there is today a shift from Glass Frit for eutectic/metal-based bonding mainly to increase real estate by smaller bond frames. Metal direct bonding also gives good hermeticity and mechanical stability for many MEMS applications. For example, Nasiri process is using eutectic bonding of the MEMS directly on the aluminum layer of the CMOS wafer. This leads to smaller package footprints & package heights. STMicroelectronics’ latest 3-axis accelerometer (LIS3DH) also shows a different
sealing technique compared to what is usually done: gold eutectic sealing allows a dramatic die size reduction.

For CMOS Image sensors, the advent of the BSI (Back Side Illumination) technology has raised a competition between Molecular Bonding and adhesive bonding. Here, cost and final application will drive the technology final choice.

Yole Développement has estimated the wafer bonder to have big market growth for the next year. The growth will be driven small size wafer for LEDs and 12” wafer for 3D stacking and CIS. Although EV Group is market leader in permanent bonding, the growth of the bonding equipment market is attracting challengers.

Yole Développement’s report analyzes in details the technical & economical evolution of the permanent wafer bonding process. It gives, for example, 2010-2016 market forecasts for permanent bonding, number of equipment, an overview of the different bonding approaches and equipment players market shares and competitive information.

This market & technology report also presents the trends for permanent bonding, W2W vs. C2W analysis for 3D integration. It describes the applications for wafer bonding with main characteristics, challenges.

About Permanent Wafer Bonding Report:

- **Authors**
  
  **Dr. Eric Mounier** has a PhD in microelectronics from the INPG in Grenoble. Since 1998 he is a co-founder of Yole Développement, a market research company based in France. At Yole Développement, Dr. Eric Mounier is in charge of market analysis for MEMS, equipment & material. He is Chief Editor of Micronews, and MEMS’Trends magazines (Magazine on MEMS Technologies & Markets).
For Immediate Release:

- **Catalogue price: Euros 3,990.00 (single user license) - Publication date: May 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**
  Acreo, AML, APM/UMC, Avago, Ayumi, Bosch, Colibrys, Dalsa, Discera, EVGroup, FhG IMS, FLIR, IBM, Icemos, IMEC, IMT, Infineon, Infineon, Invensense, KTH, Leti, Lumileds, MEMStech, Micralyne, Mitsubishi Heavy Industries, Omron, Osram, Qualcomm, Raytheon, RPI, Sand9, Semefab, Sensoror, Silex, SOITEC, STM, SUSS MicroTEC, Tezzaron, TI, tMt, Tohoku University, TowerJazz, Tracit, Triquint, Tronic’s, TSMC, VTI, Xcom, Ziptronix

###

About Yole Développement

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 and microfluidics, 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.

**Consulting Services**

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

**Reports**

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

**Media**

- Critical news, Bi-weekly: Miconews, the magazine
- Online disruptive technologies website: www.i-micronews.com
- Exclusive Webcasts
- Live event Market Briefings

**Contacts:**

- Services : Jean-Christophe Eloy (eloy@yole.fr)
- Reports: David Jourdan (jourdan@yole.fr)
- PR & Media : Sandrine Leroy (leroy@yole.fr)