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VARIAN

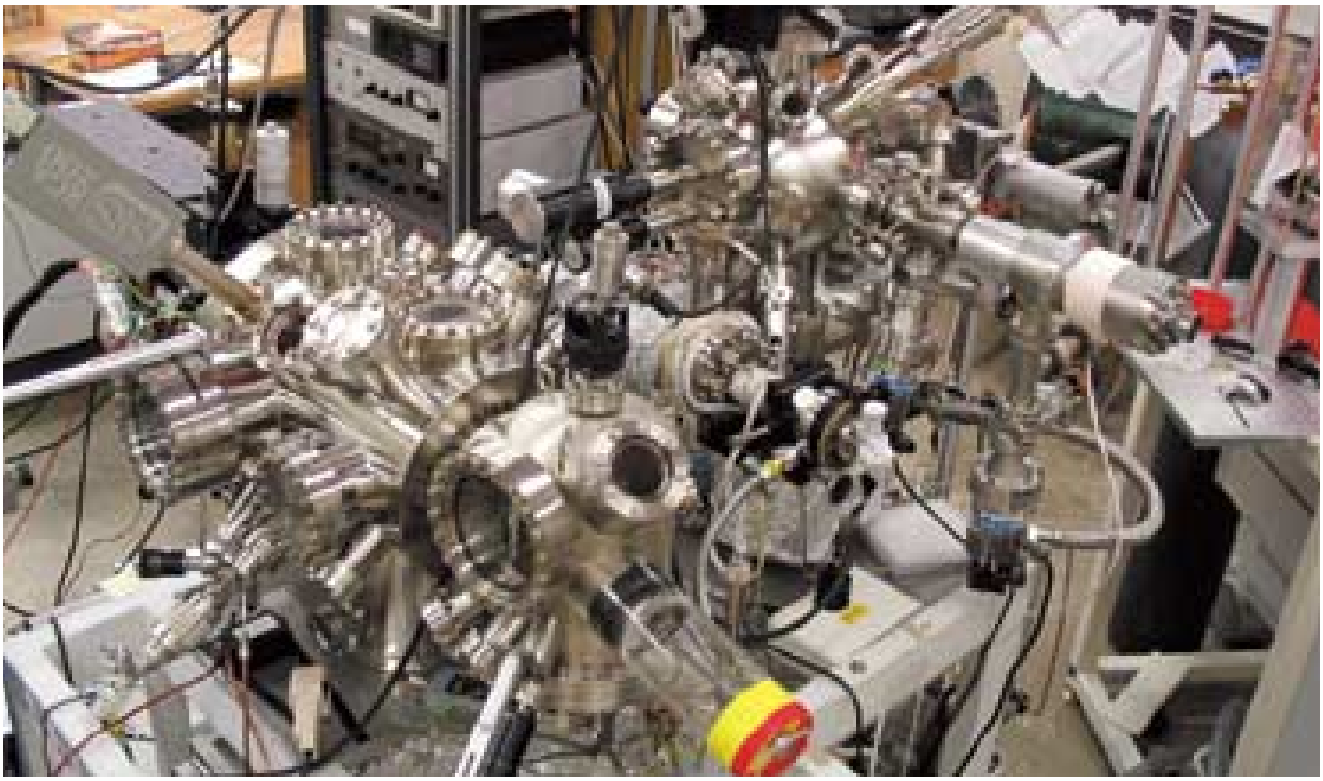
HIGH ENERGY PHYSICS

solutions

Varian Vacuum Aids Ground-breaking Experimentation

IN THIS ISSUE:

Varian Vacuum Technologies works very closely, in multiple disciplines, with many prestigious university and government research laboratory customers. A key customer account is the Materials Physics group at Florida International University (FIU) in Miami, Florida, where a full range of Varian vacuum products and technical support have contributed to the success of their state-of-the-art materials research project. Dr. Jiandi Zhang Ph.D. is the scientist and professor in charge of this lab that receives grant funding from the National Science Foundation, and agencies such as the US Dept. of Energy, to perform core materials physics research.



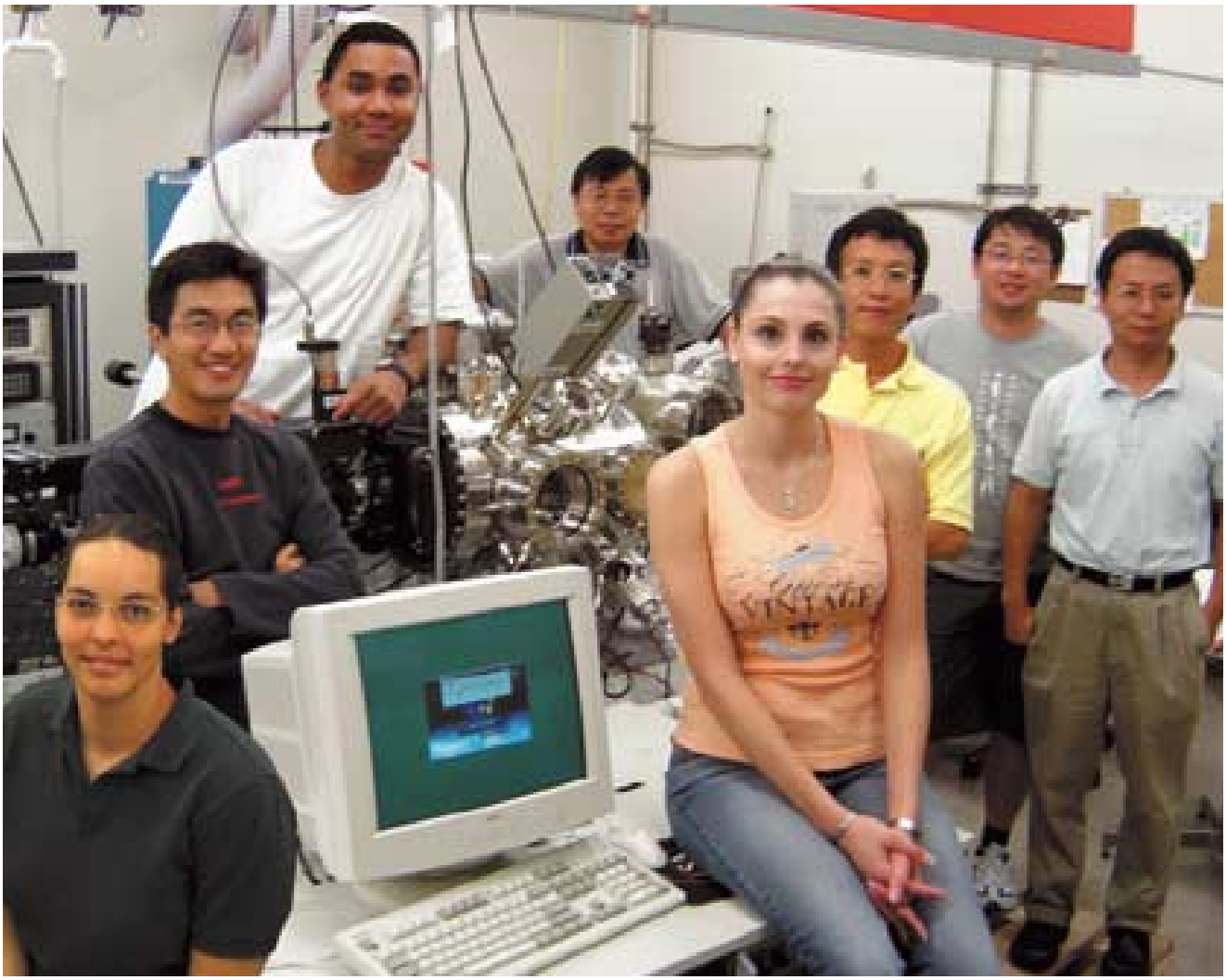
The Laser Assisted Molecular Beam Epitaxy (LMBE) system.

Enabling next generation flat planel displays... and more

The research applications in the lab are aimed at meeting the needs of our modern day world. As our electronic devices become more and more sophisticated, the materials that are used inside them must be able to perform feats they never could before. The experiments in the FIU lab may improve many aspects of modern life, such as next generation flat panel displays that replace bulky computer monitors; high-density data storage in compact disk players and computers; and even much more efficient photo-voltaic cells that convert solar energy to electricity.

It's all about the materials

A critical tool in this lab is an Ultra High Vacuum (UHV), Laser Assisted Molecular Beam Epitaxy (LMBE) system. LMBE is a new technology to achieve atomically controlled layer-by-layer growth of oxides and other complex materials on a surface, allowing new possibilities in the materials that are used in electronic devices.



The engineers of the FIU team. From left to right: Fernanda Foertter, Hao Sha, Stephan Stacco, Chenxi Lu, Sarah Bryan, Jiandi Zhang (PI), Yanxin Liu, and Lei Cai (post doc.).

The scientific details

According to Jiandi, "The interest of these materials stems from the richness of their novel properties, the complexity of underlying physics, and promise of technological applications. These materials are deposited onto a substrate by using a high power laser beam and monitoring the growth in real-time by newly designed in-situ reflection high-energy electron diffraction (RHEED). By using LMBE processes, the superlattices of transition-metal oxides, and other complex materials, are grown and studied at atomic resolution levels. The objective is exploring new physical phenomena and new functionalities through materials 'tailoring'."

Varian, Inc. vacuum instruments, at every step

Tom Drisgill, Varian territory sales engineer, explains the part Varian instruments play in the process. "In order to perform the experiments, a super-clean, very low-pressure environment is required. Through the process of first rough pumping the chamber system with Varian dry scroll pumps, most of the air in the chamber is removed. Then, our turbomolecular pumps evacuate the chamber down to high vacuum (low pressure) regimes. Once the pressure is low enough, Varian Vaclon® pumps are used to lower the pressure even more, until the molecular density is measured in the very low 10 to the minus 11 torr range.

"Varian senTorr™ and Multi-gauge™ instrument controllers are used to power UHV ionization gauges and to display the pressures that are achieved. Glass view ports, isolation valves, and high vacuum flanges, with metal gasket type seals, are located on the vacuum chamber for mounting various manipulators and feed-throughs. Varian is there, all the way, glad to be part of this ground-breaking experimentation."

Varian Scroll-pump Provides Lower Cost-of-Ownership for Loadlocks Applications

STS are now providing as standard the Varian Scroll pump TS600 as a cost-effective loadlock pumping solution

During the last 12 months STS have been testing the Varian TriScroll pump as a replacement for the Edwards E2M40 used in the low end lock pumping requirement.
The Varian TriScroll TS600 offers a cost-effective dry pumping solution with reduced CoO as an alternative to the E2M40 wet pump.

Benefits include:

- **Reduced CoO due to reduced utility costs and maintenance**
- **No Oil therefore no backstreaming of oil into the vacuum system**
- **No annual expensive PFPE oil change**
- **No environmental issues regarding disposal of PFPE oil**

Varian and STS have been working closely together to provide a reliable cost effective alternative to "wet" pumps for loadlock pumping. The TS600 will now be standard on all STS "MPX" and "MACS" loadlocks.

Cost of Ownership (CoO)	Varian	Edwards
Utility costs	**TS600**	**E2M40**
Power consumption @ base pressure (kW)	0.045	1.1
Power costs per hour: (0.08 per kWh)	0.04	0.09
Annual utility costs: £ GBP	288.00	704.00
Service interval hours*	20.000	20.000
Service costs £ GBP**	980	1.980
Commulative costs £ GBP		
Year 1	286	704
Year 2 (service required)	1556	3388
Year 3	1844	4092
Year 4 (service required)	3112	6776
Year 5	3400	7480
Average anualised cost over 5 years	**680**	**1496**

** Loadlock application typical 20.000 hours service interval.*
***Service includes parts and required labour.*

And will be offered as an upgrade to existing customers using E2M40 pumps. Savings on average yearly CoO over a five year period can be up to 54% when switching to the TS600 (table 1). The power consumption for the TS600 is less than half of an

E2M40, so yearly utility can be cut by 50%. Servicing cost are reduced again by half due to the easy service operation and reduced parts replacements. Further savings can be added to those shown if replacement PFPE oil is required during service intervals.

STS designs and manufactures a range of highly specialised machines incorporating innovative technology used in the production of semiconductors and semiconductor related devices. Semiconductors, which are miniature electronic circuits, are usually associated with memory chips in computers. However, STS serves a range of applications outside this 'mainstream' memory chip market in several emerging sectors within the telecommunications, information technology and new micro electromechanical systems industries.

Market Leaders in Plasma Processing Technologies

STS is a market leader in silicon etching within the growing MEMS market with patent protected technology. In addition, STS has strong presence in each of its other served markets and distributes its machines world-wide through an experienced sales and service operation consisting of direct sales, distributors and agents.

These emerging semiconductor markets have experienced rapid growth in recent years and have the potential for further growth as demand continues to increase for high technology products such as fibre optic telecommunications networks for Internet infrastructure, high speed wireless communication devices for mobile telephony and a new generation of sensor devices used in the automotive and aerospace industries and other mass markets.

STS – History

The business was originally established in 1984 as Special Research Systems Limited ("SRS"), a division of Electrotech Equipment Limited ("Electrotech"), to develop and manufacture plasma processing machines.

In 1989, SRS was merged with two other Electrotech subsidiary companies to create a new company of 65 employees which was renamed at Surface Technology Systems Limited ("STS") in 1990.

STS maintained close technical links with Electrotech, but operated with increasing autonomy and established its own dedicated international sales and service network. As part of this network, Sumitomo Precision Products Co., Limited ("SPP") was appointed in 1993 as the Company's distributor in Japan. In March 1995, STS was acquired by SPP. Shortly after the acquisition, the board of directors took the strategic decision to focus resources into two key market segments, being MEMS and Data Storage, which led to strong growth being achieved by the business. Since then the Group has extended its activities to provide machines for the manufacture of optoelectronic and wireless communication devices, and Advanced Packaging solutions.

STS
SURFACE TECHNOLOGY SYSTEMS

In May 1997, STS relocated to a new purpose built factory at Imperial Park, Newport and received the Queen's Award for Export Achievement. In the following year, STS also received the Queen's Award for Technological Achievement for its Advanced Silicon Etch (ASE®) Process. At the end of 2000, STS was floated on the London Stock Exchange. The capital raised enabled STS to further invest in technology and product-related research and development, as well as expanding the after-sales service structure. Following the Placing, the SPP shareholding was diluted to 66.7% of the issued share capital on Admission. enquiries@stsystems.co.uk