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**Picosun
contributes
to new
world record
in X-ray
microscopy**

ESPOO, Finland, September 30, 2009 – Groundbreaking work by scientists from Switzerland, Finland and Germany has led to a new world record in X-ray microscopy. For the first time ever, features below 10 nm in width were resolved.

Key to this new world record was thin films created through the use of Atomic Layer Deposition (ALD). ALD work was carried out with a Picosun SUNALE™ R-150 reactor at the premises of the University of Helsinki's Laboratory of Inorganic Chemistry. One of the Finnish scientists, Dr Tero Pilvi, has since joined the staff of Picosun as Technical Sales Manager.

October issue of Ultramicroscopy Journal carries an article "Advanced thin film technology for ultrahigh resolution X-ray microscopy" by Joan Vila-Comanala, Jörg Raabe and Christian David from the Swiss Paul Scherrer Institute, the brand new holder of the X-ray microscopy spatial world record, Mikko Ritala and Tero Pilvi from the University of Helsinki, Konstantin Jefimovs from Eidgenössische Materialprüfungs- und Forschungsanstalt (EMPA, Swiss Federal Laboratories for Materials Testing and Research) in Switzerland, Rainer H. Fink from Friedrich-Alexander Universität in Germany, Mathias Senoner from the

German Bundesanstalt für Materialforschung und -prüfung (BAM, Federal Institute for Materials Research and Testing), and Andre Maassdorf from Ferdinand-Braun-Institut für Höchstfrequenztechnik (Ferdinand-Braun Institute for High-Frequency Technology) in Germany.

The technology of X-ray microscopy was discovered some 100 years ago. It is a preferred technology for high-resolution imaging of biological and inorganic materials. X-ray microscopy can study materials at extreme nano-levels. Technology has, however, limited the useful ability to study features below 25 to 30 nm in width. For the past whole decade, the resolution of X-ray microscopy has been stagnated at this level. Some successful results have been reported at the 15 nm level, but these have not produced the required reproducibility to become really useful. The Swiss-Finnish-German group has finally solved the deadlock.

ALD is a thin film method which enables completely controlled growth of extremely conformal films through its signature self-limiting, sequential surface reactions. ALD produces complex layer structures with atomic level accuracy. ALD processes can be reproduced with stunning accuracy.

The group produced a modified Fresnel zone plate (FZP) which is the key component of X-ray microscopy. The focusing structures of the modified FZP are based on the conformal deposition of high refractive index material by ALD onto the sidewalls of a pre-patterned template made from a low refractive index material. This new focusing structure achieves an unprecedented spatial resolution in X-ray microscopy. Line widths of down to 9 nm were successfully resolved.

X-ray microscopy serves biology, biomedicine and materials science. The resolution of X-ray microscopy is between that of the traditional optical microscope and the electron microscope. The main advantage of X-ray microscopy over electron microscopy is that it can view biological samples in their natural state. X-ray microscopy produces higher penetration power and can inspect much thicker samples than comparable methods can. X-ray microscopy is also capable of producing three-dimensional tomograms of individual cells of living organisms.

One of the most interesting fields of research in nano-sciences is magnetism. The results of this research will find their widest use in tomorrow's computers and computer-controlled electronics. Computers need to be packing ever more data into ever smaller space while achieving faster and more reliable ways to read and write this data. Controlling the magnetic properties of the ultra-fast, ultra-small electrons is studied with magnetic soft X-ray microscopy. Manipulation of electron spins will revolutionize electronics. Professor Junsaku Nitta's Quantum and Materials Science Laboratory at Tohoku University in Japan is using a Picosun SUNALE™ R-150 ALD reactor. They study, among other things, electronics based on the spin degrees of freedom of the electron by controlling electron spins in semiconductor channels by using gate bias voltage.

Picosun develops and manufactures Atomic Layer Deposition (ALD) reactors for micro- and nanotechnology applications. Picosun represents continuity to over three decades of ALD reactor manufacturing in Finland. Picosun is based in Espoo, Finland and has its US headquarters in Detroit, Michigan. SUNALE™ ALD process tools are installed in various universities, research institutes and companies across Europe, USA and Asia. The inventor of ALD, Dr. Tuomo Suntola, is a member of the Board of Directors of Picosun. Picosun is a part of Stephen Industries Inc. Oy.

Additional information:

Picosun Oy, Mr. Juhana Kostamo, Managing Director

Tietotie 3, FI-02150 Espoo, Finland

Tel. +358 50 321 1955; Fax. +358 20 722 7012; e-mail: info (at) picosun.com; www.picosun.com