


# Jonas Sundqvist

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## Summary

Jonas Sundqvist received his PhD in inorganic chemistry from Uppsala University, Department for Materials Chemistry at The Ångström Laboratory in 2003 where he developed ALD and CVD processes for metal oxide ALD and CVD processes using metal iodides. In 2003 he joined Infineon Memory Development Centre (MDC) as a process engineer for the development of high-k and metal nitride ALD processes. Later at Qimonda (2006) he was a member of the Materials Management team for precursor procurement and acquisition with special focus on ALD precursors for DRAM development and production. In 2009 he joined Fraunhofer Center Nanoelectronic Technologies (CNT) as an expert for thin film deposition with special focus on high-k dielectrics and electrode materials for DRAM, eDRAM, BEOL MIM Cap and HKMG technologies. In 2010 he founded ALD Lab Dresden together with TU Dresden and in 2013 he became Group Leader of High-k Devices Group at Fraunhofer CNT which at the same time became a business unit of Fraunhofer IPMS. In 2014 Jonas Sundqvist founded BALD Engineering, an independent Networking Platform for ALD. In 2015 he spent at Lund University as Laboratory operations manager leading the day-to-day work of Lund Nano Lab, supervising the daily lab activity and taking responsibility of the main infrastructure of Lund Nano Lab. In 2017 he and co-workers from Nano Lund co-founded ALIX Labs AB - a start-up for self-aligned nanopatterning technology. and since 2021 he is CEO. 2015-2020 Jonas was Group Leader at The Fraunhofer IKTS Thin Film Technology Group. Since 2015, he is a Senior Technology Analyst at TECHCET CA LLC for ALD/CVD Precursor and Specialty Electronic Gases, now at full time. Since May 2021 he is Adjunct Senior Lecturer in Inorganic Chemistry at Linköping University, Sweden.

Jonas Sundqvist has over 20 years of experience, holds 10 patents, and authored or co-authored more than 30 publications in the fields of ALD and CVD process development. He is Conference Co-Chair for the Annual TECHCET/CMCFabs Critical Materials Conference and EFDS ALD For Industry.

## Experience

### Co-founder and CEO

AlixLabs

Aug 2019 - Present (3 years 11 months)

AlixLabs AB provides an ALE-based method of manufacturing nanostructures with a characteristic size below 20 nm. This is a new method of nanostructure fabrication using the atomic layer etching process, which is inherently a damage-free etch process. The recently discovered etching process selectivity to inclined surfaces can be used as a mask and in this way walls of tapered structures. The inclined surfaces can be readily fabricated by e.g. dry etching or epitaxial growth and will provide masking during the atomic layer etching process. This process, therefore, provides access to the fabrication of extremely small structures in a very precise and efficient way.

### Adjunct Associate Professor in Inorganic Chemistry

Linköping University

May 2021 - Present (2 years 2 months)

Adjunct Associate Professor in Inorganic Chemistry at the Department of Physics, Chemistry and Biology (IFM), Linköping University, Sweden. The Henrik Pedersen research group at Linköping

University is working on chemical vapour deposition (CVD) with the aim to develop better CVD routes to, primarily, electronic materials. One of the most important methods to deposit thin films is CVD, which uses chemical reactions between precursor molecules containing the atoms needed for the film. In our work to develop better CVD routes, we develop new precursor molecules, experiment with new ways of using plasma discharges in CVD, and explore various time-resolved CVD approaches and we perform computational studies of CVD gas phase- and surface chemistry.

## **Senior Technology Analyst for ALD/CVD Precursors & Electronic Gases**

TEHCET and the Critical Materials Council

Aug 2015 - Present (7 years 11 months)

Senior Technology Analyst at Techcet Group, LLC. for ALD/CVD Precursors & Electronic Gases. TECHCET is a Technology Focused Materials Market Research and Consulting Company Specialized in Process Materials Markets, Supply Chain, and Technology Trends Analysis for Semiconductor, Display, Solar/PV, and LED Markets.

## **Advisory Board Member**

The European Society of Thin Films (EFDS)

Nov 2018 - Present (4 years 8 months)

The European Society of Thin Films (EFDS) is a non-profit organisation active in the industrial field of thin-film technologies. The office is in Dresden – right at the heart of the European semiconductor industry and a major centre of vacuum equipment manufacturing.

The EFDS is represented by their member companies, institutions and individuals (201 members as at November 2018) and by nine Executive Committee members, many members of the Advisory Board and expert committees, one national co-ordinating agent and four office staff.

## **Founder**

BALD Engineering AB

2015 - Present (8 years)

Consulting, training, blogging, networking and spreading news and information about ALD - Atomic Layer Deposition

BALD Engineering - Born in Finland, Born to ALD

The worlds leading news blog on ALD : <http://www.blog.baldengineering.com/>

## **Group Leader**

Fraunhofer IKTS

May 2017 - Apr 2020 (3 years)

Group Leader, Thin Film Technology, System Integration and Technology Transfer, Fraunhofer IKTS. Thin-Film Technology: The working group is engaged in research and development of CVD technologies for different applications. Several methods are used: thermal CVD processes at low pressure and atmospheric pressure (LPCVD, APCVD), plasma-enhanced CVD (PECVD) and atomic layer deposition (ALD). For some applications CVD and sol-gel methods are combined.

Layer materials like hard coatings, aligned carbon nanotubes (CNT) and dielectrics based on oxides of hafnium, zirconium and titanium and different perovskite materials are focused. The applications cover

wear-resistant coatings, actuating elements, sensors, energy management and microelectronics. The preparation of new thin film materials also requires the modification of known processes as well as the development of new CVD technologies.

This comprises the test of new precursor systems and detailed process studies. The investigations are supported by thermodynamic calculations and an extensive characterization of composition, structure and properties of the layers.



## **Senior Scientist**

### **Fraunhofer IKTS**

May 2016 - Apr 2017 (1 year)

Thin-Film Technology: The working group is engaged in research and development of CVD technologies for different applications. Several methods are used: thermal CVD processes at low pressure and atmospheric pressure (LPCVD, APCVD), plasma-enhanced CVD (PECVD) and atomic layer deposition (ALD). For some applications CVD and sol-gel methods are combined.

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## **Senior Scientist / Lab Manager**

The Faculty of Engineering at Lund University, LTH

Jan 2015 - Aug 2016 (1 year 8 months)

From September 2015: Part time Senior Scientist on Atomic Layer Deposition (ALD), Atomic Layer Etching (ALE) and clean room expansion.

Until August 2015: Lab Operations Manager of Lund Nano Lab. Responsible for day-to-day operations of the Lund Nano Lab, including safety, equipment and lab infrastructure service and maintenance, lab budget, and contacts with external customers.



## **ALD Senior Scientist**

Technische Universität Dresden

Sep 2015 - Apr 2016 (8 months)

Senior Scientist at ALD Lab Dresden



## **Group Leader High-k Devices**

Fraunhofer IPMS

Jan 2013 - Jan 2015 (2 years 1 month)

Leading an experienced Team of 18 Students, Engineers and Scientists for Development of Leading edge 2D and 3D MIM Capacitors, HKMG and Ferroelectric NVM (FeFET and FRAM). Including 300mm processes for SiGe Epitaxy, Large Batch LPCVD, ALD, PEALD, RTP, In-line Metrology and Electrical characterization, from test & design to reliability.



## **ALD Senior Scientist**

Oct 2009 - Jan 2013 (3 years 4 months)

Expert for thin film deposition with special focus on high-k dielectrics and electrode materials for DRAM, eDRAM, BEOL MIM Cap and HKMG technologies and Si, SiGe Epitaxy.

- Tool ownership for deposition tools in the Fraunhofer-CNT (responsible for tool set up, modifications, interface to supplier, proposal for tool upgrades, modifications)
- Collaboration with R&D partners (industry, institutes), transfer of development results to industry partners
- Supervision of diploma/thesis students
- Project definition with funding authorities and acquisition
- Develop processes and operate advanced dielectric layer deposition tools (ALD, CVD, PVD) for various applications
- Coordination and implementation of physical and electrical characterization of thin films,
- Supervision of technical staff and PhD-students
- publications/active participation at scientific conferences and tutorials



## **ALD/CVD Precursor and Process Development & Procurement**

Qimonda

Apr 2006 - Apr 2009 (3 years 1 month)

Explanation of Duties and Role:

(1) Process engineer ALD and CVD processing DRAM Capacitor module. Process owner for high-k dielectric and metal electrode processes. Single point of contact for tool suppliers. Responsible for Tool and Process specifications for new ALD and CVD processes. Process development and production support.

(2) Project leader Rapid Precursor Screening. ALD representative for regular meetings between Purchasing/Materials Management/Unit Process Development and chemical suppliers. Regular technical teleconferences with chemical suppliers. Updating, reviewing and communicating the ALD Precursor roadmap. Owner of the Precursor data base (MSDSs, Chemical and physical data). Coordination with external partners for precursor and ALD topics, mainly, Fraunhofer Institute (CNT and IKTS), University of Helsinki, TU Dresden, IMEC. Technical Support Precursor procurement to Purchasing and Materials Management incl. supplier ranking and supplier strategies.



## **ALD Process engineer**

Infineon Technologies

Nov 2003 - Apr 2006 (2 years 6 months)

Process engineer ALD and CVD of metal electrodes and high-k dielectrics



## **PhD position & Researcher**

Uppsala University

Jul 1999 - Nov 2003 (4 years 5 months)

(1) PhD position in the Department for Materials Chemistry. Development of metal oxide ALD and CVD processes. Design and construction of ALD/CVD research reactors.

(2) Teaching of solid state chemistry. Theory and practical laboratory assignments.



## **Armored Personnel Carrier (APC) Driver and Gunner**

Swedish Armed Forces

Aug 1994 - Jun 1995 (11 months)

Armored Personnel Carrier (APC) Driver and Gunner. PBV 3021 Artillery fire control unit in a Mechanised Battalion.

## **Education**



### **Uppsala University**

PhD, Inorganic Chemistry

Jul 1999 - Jun 2003

Advanced Micro Engineering PhD School at The Ångström Laboratory. Industrial PhD student position in the Department for Materials Chemistry. Development of metal oxide ALD and CVD processes. Design and construction of ALD/CVD research reactors.

Teaching of solid state chemistry, theory and practical laboratory assignments.



### **Uppsala University**

M.Sc., Chemistry

1995 - 1999

Thesis: 3DLCVD of titanium rods for MEMS Applications  
at Institute for Micromanufacturing, Louisiana Tech



### **Lars Kagg**

Engineer's degree, Electrical and Electronics Engineering

1991 - 1994

## **Skills**

Thin Films • Atomic Layer Deposition • Materials Science • CVD • Semiconductors • ALD • R&D • Nanotechnology • Powder X-ray Diffraction • Characterization