Overview of Early Publications on Atomic Layer Deposition


1 University of Tartu, Institute of Physics, Estonia; 2 Drexel University, Philadelphia, Pennsylvania, USA; 3 CNRS University of Montpellier, Montpellier, France; 4 Cambridge, Massachusetts, USA
5 Aalto University, Espoo, Finland; 6 Miktech Oy, Mikkeli, Finland; 7 St. Petersburg State University, St. Petersburg, Russia; 8 Institut des Nanotechnologies de Lyon & Joint Laboratory InCVD, Lyon, France; 9 Argonne National Laboratory, Illinois, USA; 10 Tyndall National Institute, University College Cork, Lee Maltings, Cork, Ireland; 11 Fondazione Bruno Kessler, Center for Materials and Microsystems, Trento, Italy; 12 VTT Technical Research Centre of Finland, Espoo, Finland
13 Ioffe Physical Technical Institute, St. Petersburg, Russia; 14 University of Colorado Boulder, Colorado, USA; 15 STMicroelectronics, Agrate Brianza, Italy; 16 St. Petersburg State Technological Institute (Technical University), St. Petersburg, Russia; 17 Bilkent University, Ankara, Turkey; 18 Linköping University, Linköping, Sweden; 19 Eindhoven University of Technology, Eindhoven, and TNO, Eindhoven, The Netherlands; 20 University of Jyväskylä, Jyväskylä, Finland; 21 Seitek50, Palm Coast, Florida, USA; 22 Fraunhofer IPMS-CNT, Dresden, Germany; 23 Brandenburg University of Technology Cottbus-Senftenberg, Cottbus, Germany; 24 Delft University of Technology, Delft, the Netherlands; 25 Laboratorio MDM, IMM-CNR, Agrate Brianza, Italy
riikka.puurunen@vtt.fi

Atomic layer deposition (ALD) is a technique that has been instrumental in enabling the semiconductor industry to maintain its adherence to Moore’s Law, and is becoming a game-changer in several other fields. A worldwide open collaborative initiative called the “Virtual Project on the History of ALD” (VPHA) was launched in summer 2013 to explore how the ALD concept was developed; which were the first ALD experiments; when, where, why and by whom they were made. This poster lists the early ALD publications up to 1986, and provides individual comments on the significance and contents of the publications. ALD was invented independently (at least) twice, under the names “molecular layering” and “atomic layer epitaxy”. It is seen, for example, that TiO2 has been grown by ALD from TiCl4 and H2O on silica particles in 1965 and that ALD in fluidized bed has been modelled in 1979. This overview should raise awareness of the early ALD work that was carried out in countries such as Bulgaria, Estonia, Finland, France, Germany, Japan, the Soviet Union, and the United States. This will help today’s growing global ALD community to put their research into context.

Acknowledgements: We are grateful for Dr. Tuomo Suntola’s general support during the VPHA and for Dr. Aziz Abdulagatov’s and Anniina Titoff’s assistance in initiating it. The VPHA would not have been possible without the recent advances in professional social networking and cloud computing. RLP acknowledges funding from the Finnish Centre of Excellence on Atomic Layer Deposition. The author list is intentionally in alphabetical order.