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# Atomic Layer Deposition Applications 14

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## Preface

The papers contained in this issue of *ECS Transactions* were originally presented in the symposium “Atomic Layer Deposition Applications 14”, held during the Americas International Meeting on Electrochemistry and Solid State Science (AiMES 2018). This is a joint conference of the 234th Meeting of The Electrochemical Society (ECS), the XXXIII Congreso de la Sociedad Mexicana de Electroquímica (SMEQ), and the 11th Meeting of the Mexico Section of The Electrochemical Society.

ECS conferences are ones of the largest annual meetings where theoretical and experimental breakthroughs at the forefront of electrochemical and solid state science and technology are presented. They serve as a major platform for the exchange of interdisciplinary results, encouraging research, discussion, critical assessment, and dissemination of knowledge in electrochemical and solid state science and technology. Scientists, engineers, and industry leaders come from around the world to attend the technical symposia, poster sessions, panel discussions, professional development workshops, networking and social events offered throughout the course of each meeting. The meeting also features an extensive exhibition where industrial leaders showcase some of their greatest innovations including cutting-edge instruments, materials, systems, publications, and software, as well as other products and services.

This time the conference took place at the Moon Palace Resort along Cancun’s Mayan Riviera in Mexico from September 30 to October 4, 2018. It attracted around 2,000 participants with more than 2100 abstracts presented in 14 technical sessions with 53 symposia across 5 days.

The symposium “Atomic Layer Deposition Applications 14” has been an excellent forum for sharing cutting edge research on both existing and emerging ALD applications as well as fundamental aspects of the ALD technology. The symposium’s main objective is to address the latest advances in ALD-based processes and applications. Atomic Layer Deposition enables the synthesis of ultra-thin highly conformal coatings on 3D topographies with excellent control of both thickness and composition. Consequently, ALD has found an increasing number of applications in the field of nanotechnology and nano-manufacturing.

The symposium has been kicked off by a tutorial on atomic layer etching by Dr. T. Lill (Lam Research) on day one and another tutorial on precursor design by Prof. C. Winter (Wayne State University) on day two, complemented by an interesting review on the history of atomic layer deposition by Prof. R. Puurunen (Aalto University, Finland). Two sessions of the symposium have been fully dedicated to area-selective deposition (ASD) and atomic layer etching (ALE) which are rapidly emerging topics within the ALD community, thanks to a strong pull from the semiconductor industry.

The miniaturization of the electrical components in integrated circuits has sparked the first industrial application of ALD in nano-electronics. While the semiconductor industry is still driving the development of many ALD-based processes, solar cells, energy storage, gas sensing and life science are some of the new emerging fields of application, which have been reviewed in this annual symposium. The latest advances on the synthesis and functionalization of 3D materials – such as nanotube and porous layers - have been presented and discussed during the symposium, demonstrating the unique advantages of ALD for vapor-phase nano-manufacturing.

Although not complete, this year's Transactions cover a representative collection of papers on some of the major themes treated at this symposium. The papers are grouped in several chapters. The first chapter on the history of atomic layer deposition is followed by Chapter 2 on the synthesis of new ALD-grown materials such as III-V nitrides, and ferroelectric thin films. Next, Chapter 3 is on ALD of tungsten carbide films, Chapter 4 on ALD of tin(IV) oxide for gas sensing applications and to conclude, Chapter 5 is on atomic layer etching of two-dimensional MoS<sub>2</sub>.

We finally express our special thanks to all speakers, invited and contributing, for their continued interest in this symposium, and for submitting high-quality abstracts and preparing their manuscripts in time. We conclude by stating that the success of the symposium is greatly and positively influenced by the financial support given this year by the following industrial sponsors: ASM, Air Liquide, Applied Materials, Lam Research, Mattson Technology Inc., and RASIRC. Their support and loyal sponsorship are highly appreciated. Also, the continued support of the EPD division and the DST division of The Electrochemical Society is gratefully acknowledged.

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## Facts about ECS

The Electrochemical Society (ECS) is an international, nonprofit, scientific, educational organization advancing the theory and practice of electrochemistry and solid state science and technology, and allied subjects. The Society was founded in Philadelphia in 1902 and incorporated in 1930. There are currently over 8,400 members from around the globe representing 13 technical division and 23 geographical sections and a growing student membership program with almost 70 student chapters. The Society is also supported by more than 800 corporations, government agencies and academic institutions through institutional membership, corporate programs and subscriptions.

The technical activities of the Society are carried on by divisions. Sections of the Society host symposia, programs and events focused on their respective geographic regions. Major international meetings of the Society are held in the spring and fall of each year. At these meetings, the divisions and partnered organizations hold general sessions and sponsor symposia on specialized subjects.

The Society has an active publication program that includes the following:

*Journal of The Electrochemical Society* — (JES) is the flagship journal of The Electrochemical Society and the oldest peer-reviewed journal in its field. Since its founding in 1902, JES has evolved into one of the most highly cited and prestigious journals in electrochemistry and materials science with a cited half-life of greater than 10 years.

*ECS Journal of Solid State Science and Technology* — (JSS) is one of The Electrochemical Society's newest peer-reviewed journals. Launched in 2012, JSS covers fundamental and applied areas of solid state science and technology, including experimental and theoretical aspects of the chemistry and physics of materials and devices.

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