Spatial Atomic Layer Deposition: Much more than scalable fast ALD

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Abstract

Spatial Atomic Layer Deposition (SALD) is a recent variant of ALD that offers fast processing, even at atmospheric pressure, while preserving the unique assets of ALD, namely, precise thickness control down to the nanometer, high-quality films even at low temperatures, and unique conformality. As a result, SALD is ideal for applications requiring high throughput at low cost, such as new generation photovoltaics, LEDs or packaging. In particular, the SALD approach based on close-proximity deposition heads is highly versatile since it can be easily customized by proper design of the deposition heads and because the deposition takes place in the open air without the need of any deposition chamber.

But there is more to SALD than a faster and scalable version of ALD. In particular, I will illustrate how 3D printing can be used to prototype and customize close-proximity deposition heads, and how in so doing SALD can indeed be tuned to deposit custom patterns without the need of pre-patterning steps. This approach represents a new versatile way of printing functional materials and devices with spatial and topological control, thus extending the potential of SALD, and of ALD in general. I will then present recent studies showing the effect of open-air processing on the properties of the thin films deposited with our close-proximity system, and how the choice of precursor can have a huge impact on the final properties of the materials deposited. The potential of SALD will be illustrated through different examples of applications of the thin films developed in our group, including photovoltaics and transparent electrodes based on composites of metallic nanowire networks and oxide coatings.

BIO:

Dr. David Muñoz-Rojas received his degree in organic chemistry in 1999 and master's degree in chemical engineering (2000) from the Instituto Químico de Sarrià (IQS, Barcelona, Spain), obtaining the P. Salvador Gil, S.I. 2000 prize. He did his PhD in materials science (2004) at the Instituto de Ciencia de Materiales de Barcelona (CSIC-UAB). Thereafter, he worked as a postdoc at the Laboratoire de Réactivité et Chimie des Solides in Amiens (France), the Research Centre for Nanoscience and Nanotechnology in Barcelona, and the University of Cambridge (Device Materials Group, UK). Dr. Muñoz-Rojas is currently CNRS research director at the Laboratoire des Matériaux et du Génie Physique in Grenoble, France. His research focuses on using and developing cheap and scalable chemical approaches for the fabrication of novel functional materials for electronic and optoelectronic applications. In particular, he has pioneered the development of the novel spatial atomic layer deposition (SALD) technique for the deposition of active components for optoelectronic devices. He is currently further developing SALD to extend the possibilities and fields of application of this exciting technique though several French National (several as coordinator), regional and local projects and a FET Open

project that he coordinates. He has published over 100 papers, and several book chapters. He is coeditor of a book on materials for renewable energy applications and is co-inventor of 6 patents.

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