Spatial Atomic Layer Deposition: a Swiss knife for materials science

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Abstract

Spatial Atomic Layer Deposition (SALD) is a recent variant of ALD. This rapid deposition method preserves all the strengths of ALD even at atmospheric pressure: high-quality, low-temperature films and nanometer thickness control, even over high-aspect-ratio substrates [1].

Therefore, SALD is ideal for applications requiring high throughput at low cost, such as new generation solar cells, LEDs or packaging. The unique conformality offered by ALD makes it interesting for membrane applications, either for physical or chemical separation [2]. SALD has not been exploited yet for this application. Pore size can be tuned for filtering species by size or thin permoselective dense layers can be deposited to reduce operation temperatures and costs. This makes the technique appealing for key applications in the next years, such as hydrogen separation.

Additionally, SALD can be used to perform selective depositions without the need to pre-treat the substrate. Indeed, 3D printing makes it possible to obtain "customized" SALD injection heads [3]. This versatile new way of printing materials and functional devices with spatial and topological control, thus extends the potential of SALD, and vapor deposition in general. This opens up a new avenue in the field of the selective deposition of functional materials.

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FIGURES

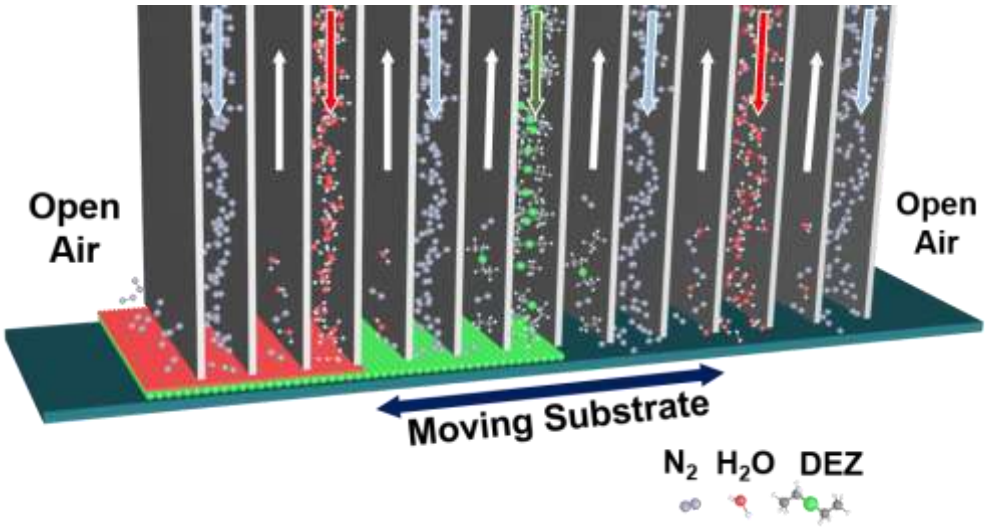

Figure 1: Scheme of a SALD close-proximity deposition head