Introducing a Surface Acoustic Wave-Based Miniaturized Aerosol Source for Controlled Liquid Precursor Delivery in ALD Processes

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Atomic Layer Deposition (ALD) demands a high precision in the delivery of liquid precursors to achieve uniform thin films. We present a novel miniaturized aerosol source technology, utilizing surface acoustic wave (SAW) techniques, to introduce liquid precursors efficiently and with exceptional control. In SAW aerosol generation (also known as SAW nebulization or SAW atomization), aerosols are formed by the interaction of a microscale liquid layer with an acoustic wave field on the surface of a microfluidic chip, which is the driving force of the miniature aerosol generator. This integrated system enables precise manipulation of liquid flow rates and generated droplet size, resulting in enhanced control over precursor evaporation. By fine-tuning the flow dynamics, this innovative approach promises significant improvements in process efficiency, uniformity, and scalability for industrial ALD applications. Our SAW-based aerosol source offers a compact, energy-efficient solution for next-generation ALD systems, paving the way for more reliable and cost-effective thin film deposition in diverse industrial applications.

Figure 1 - a) SAW-based aerosol generation in action. b) Integrated SAW aerosol source in KF40 flange system. c) Printed chrismas tree of fluorescent quantum dots on SiO2 coated Si substrate using SAW aerosol printheat.