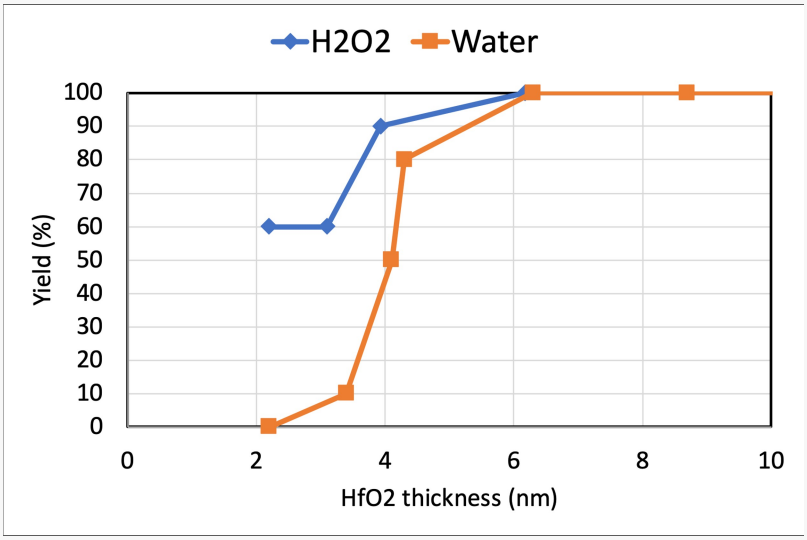
RASIRC Study Shows Improved Yield of Hafnium Oxides Devices with Hydrogen Peroxide Gas

Thinner MOSCAP Grown with H2O2 Compared to Water Vapor



Comparison Shows Significant Improvement in MOSCAP Yield from H2O2 versus Water for Very Thin Hafnium Oxide Films.

SAN DIEGO, CA, USA, June 23, 2022 /EINPresswire.com/ -- RASIRC in collaboration with University of California, San Diego (UCSD) will publish data that hydrogen peroxide (H2O2) gas is a better oxidant than water vapor for ALD growth of Hafnium Oxide films. This study is one of four technical presentations exploring RASIRC technology scheduled for the upcoming ALD 2022, the 22nd International Conference on Atomic Layer Deposition, held June 26-29, 2022 in Ghent, Belgium.

“Hydrogen peroxide is proven to generate a much denser hydroxyl layer on the surface of metals,” said RASIRC Founder and CEO Jeffrey Spiegelman. “This study shows the benefits of replacing water vapor with H2O2 when growing very thin High K films. This will be critical for the device shrinks needed for next generation devices, especially with gate-all-around, and nanosheet three dimensional structures.”

H2O2 is a better film initiator of the ALD process, particularly on HF last and hydrogen terminated surfaces when compared to water vapor. This enabled 50% faster growth of HfO2 layers for each ALD cycle and reduced leakage for a given film thickness below 6nm.

This enabled shrinkage of the HfO2 layers by replacement of water vapor with H2O2, ultimately resulting in better yields with a 33% reduction in needed dielectric thickness. Minimum HfO2 thickness possible with water vapor was 3.7nm while 2.2nm devices were high yielding with H2O2.

In addition, defects were also reduced on as grown HfO2 films, which demonstrated a reduction by almost an order of magnitude in gate voltage shift from -1.3V to 0.18V.

> Replacing water vapor with H2O2 when growing very thin High K films will be critical for next generation devices, especially with gate-all-around, and nanosheet three dimensional structures."
>
> *Jeffrey Spiegelman, RASIRC Founder and CEO*

Details on the research will be presented at ALD 2022, the 22nd International Conference on Atomic Layer Deposition, held June 26-29, 2022 in Ghent, Belgium.

Session and Related Research Presented at Upcoming ALD 2022

AF-MoP-18 Higher Effective Dielectric Constant of Hafnium Oxide When
Grown with Hydrogen Peroxide Compared to Water Vapor
Jeffrey Spiegelman, RASIRC, USA; H. Kashyap, A. Kummel, University of California at San Diego, USA
(Monday June 27, 2022 @ 5:45pm in Room Arteveldeforum & Pedro de Gante)

AS-TuP-4 In-situ Surface Cleaning and Area Selective Deposition of SiOxNy film on Cu patterns using Anhydrous N2H4 Su Min Hwang, J. Kim, D. Le, Y. Jung, K. Tan, J. Veyan, University of Texas at Dallas, USA; D. Alvarez, J. Spiegelman, RASIRC, USA; J. Kim, University of Texas at Dallas, USA
(Tuesday June 28, 2022 @ 5:45pm in Room Arteveldeforum & Pedro de Gante)

AA1-WeA-4 Scaling Down to sub-5 nm Ferroelectric Hf0.5Zr0.5O2 Thin Films with Anhydrous H2O2 ALD Oxidant Yong Chan Jung, J. Kim, H. Hernandez-Arriaga, D. Le, S. Hwang, University of Texas at Dallas, USA; D. Alvarez, J. Spiegelman, RASIRC, USA; T. Onaya, National Institute of Advanced Industrial Science and Technology (AIST), Japan; C. Nam, Y. Zhang, Brookhaven National Laboratory, USA; S. Kim, Kangwon National University, Korea (Republic of); J. Kim, University of Texas at Dallas, USA
(Wednesday June 29, 2022 at 2:15pm in Room Van Rysselberghe)

AA1-WeA-8 In-situ Half-Cycle Study of High Purity H2O2-based HfO2 Atomic
Layer Deposition for Hf based Ferroelectric Devices Applications Jinhyun Kim, Y. Jung, S. Hwang, D. Le, H. Hernandez-Arriaga, K. Tan, University of Texas at Dallas, USA; D. Alvarez, J. Spiegelman, RASIRC, USA; S. Kim, Kangwon University, USA; J. Kim, University of Texas at Dallas, USA
(Wednesday June 29, 2022 @ 3:15pm in Room Van Rysselberghe)

About RASIRC
RASIRC transforms liquids into dynamic gases that power process innovation in semiconductor and adjacent markets. By commercializing molecules for lower temperature processes, RASIRC patented technology enables the manufacture of atomic-scale oxides, nitrides, and metals. Innovative products such as BRUTE Peroxide, BRUTE Hydrazine, the Peroxidizer®, and Rainmaker® Humidification Systems are being used to develop solutions for 5G, AI, IOT, and advanced automation.

What makes RASIRC a unique industry leader is our technical expertise and commitment to solving complex industry challenges for our customers. Our team of industry experts has a proven track record of being first to market by efficiently delivering state of the art technology that reduces cost, improves quality, and dramatically improves safety. With our customers at the forefront of all we do, we continue to research, develop, and design innovative products that purify and deliver ultra-pure gas from liquids for the semiconductor and related markets. Contact RASIRC to help solve your complex problems.

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