

Startup Award: zeroK NanoTech

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zeroK NanoTech will empower users of focused ion beam (FIB) instruments by commercializing its new ion source technology. In fields from semiconductor development to sub-cellular biology, end-users have a pressing need for instruments that provide higher-resolution, faster, material modification and elemental analysis.

Concretely, our Cs⁺ Low-Temperature Ion Source (LoTIS) will enable the creation of FIB and secondary ion mass-spectrometry (SIMS) instruments with higher performance. LoTIS is ready for deployment and products featuring it are on the cusp of first sales. Revenues will come from the sale of instruments, and through license of its ion source intellectual property.

zeroK first product, FIB:RETRO, will enhance the performance of a customer's existing gallium focused ion beam system. By only changing the ion source, a significant performance improvement can be realized. The Company's in-house prototype improved the resolution of such an upgraded FIB system by a factor of 3 while also reducing the beam energy by the same factor. Through a collaboration with Intel, this system has already demonstrated its ability to perform circuit-edits on 10 nm node chips.

zeroK's second product, SIMS:ZERO, is a high-performance focused ion beam system with an integrated SIMS analyzer, capable of delivering a 100x more current into an equivalent focal spot size than today's industry standard Cs ion source. Additionally, this system collects elemental-compositional information at the ultimate physical limits of the SIMS technique (~4 nm), and is a faster, easier-to-use alternative to high-resolution EDX analysis.

zeroK NanoTech has a solid team in place to commercialize its innovations, and is managed by Dr. Adam V. Steele and Dr. Brenton Knuffman full time since 2013. The team has significant business experience now and has negotiated several contracts and licenses. zeroK's successful development project with a major semiconductor company demonstrates its ability to execute on a large prototype development project of the scale required to realize SIMS:ZERO. The Company has raised approximately \$3M to date, from a combination of grants (NSF, DoE) and commercial development contracts. The company's innovations are protected by its several patents as well as the extensive know-how required to build a functional LoTIS.

Nano Machining Analysis

High Resolution SIMS + FIB



SIMS:ZERO



Cs+ ion beam with nanometer resolution

10+ nA beam current

Full-featured FIB system

Highest resolution SIMS

Parallel readout of all masses

Obtain EDX-like spectra... without lamella prep!

Gather SIMS data 100X faster

Machine with higher precision

Endpoint using mass spectra

Nanofabrication process control using SIMS

FIB:RETRO

Low Temperature Ion Source technology available as a retrofit to existing FIB instrumentation

Cs+ ion source retrofit for high performance FIB

Li+ ion source for battery research

Smaller spot size & damage volume than Ga+

Compatible with most FIB columns

Figure 1: zeroK's products and their value proposition.