Tosoh SMD, Inc./Production of High-Quality Tantalum

Final CRADA Report

Global Security Sciences Division

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prepared by
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Participants: Tosoh SMD, Inc.

October 26, 2016

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**Non Proprietary
Final CRADA Report**

Date: October 26, 2016

CRADA Number: C-0700101

CRADA Title: Tosoh SMD, Inc./Production of High-Quality Tantalum

CRADA Start/End Date: August 6, 2007 to December 31, 2011

Argonne Dollars: \$299,977

Participant Dollars: \$0.00

Argonne PI: David Ehst

Participant(s):

Tosoh SMD, Inc. \$0.00
Name Participant Dollars

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Complete Address

Name \$ _____
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Complete Address

Name \$ _____
Participant Dollars

Complete Address

DOE Program Regina Carter, NNSA- Global Initiatives for Proliferation Prevention (GIPP);
Manager: James Nobel 202.586.3921, NN4101

Summary of Major Accomplishments:

VLSI chips use Ta, TaN, Ta₂O₅ in various roles (resistors, insulators, conductors, capacitors). Impurity limits are set by thin film physics (Ta barrier to Cu migration into Si; leakage currents from defects), and grain structure uniformity requirement is set by small features on integrated circuits—120, 90, 65 nm. Ulba Metallurgical Plant (UMP, Kazakhstan) performed R&D to achieve these required specs (including 6N purity) for Tosoh SMD. Targets for 300-mm wafers were machined at Tosoh, along with cooling/backing plate fabrication. UMP was able to meet Tosoh's established billet price target, with a required minimum of 16 tons/year of capacity.

Summary of Technology Transfer Benefits to Industry:

Tosoh SMD is pleased to have participated in the second year of the GIPP project, ANL-T2-238- KZ: "High-purity tantalum metal production." Tosoh has received and reviewed the quarterly reports and provided feedback and input as required and needed. This research of the Ulba Metallurgical Plant has been technically valuable in support of Tosoh's activities with respect to production of sputtering sources of Ta films for the semiconductor industry. This project has benefitted from the program guidance and direction given by Argonne National Laboratory .

The objectives of the proposed program are: (1) to produce Ta ingot with very high purity ($> 99.99\%$ overall, with ppm-level allowable for specific impurity elements); and (2) to provide requisite grain structure in the ingot with special metallurgical processing. We believe this research and development has a high potential to keep Tosoh competitive as the future continues to demand better performance from sputtering sources. We encourage further R&D activities and are looking forward to continued interaction.

Other Information/Results: (Papers, Inventions, Software, etc.)

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