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LLNL-TR-744899

# **Nano-Filament Field Emission Cathode Development Final Report CRADA No. TSB-0731-93**

**T. Bernhardt, T. Fahlen**

**January 22, 2018**

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# **Nano-Filament Field Emission Cathode Development**

## **Project Accomplishments Summary**

**CRADA No. TSB-0731-93**

**Date: September 13, 2000**

**Revision: 1**

### **A. Parties**

The project is a relationship between the Lawrence Livermore National Laboratory (LLNL) and Silicon Video Corporation (now called Candescent Technologies Corporation).

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Lawrence Livermore National Laboratory  
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Livermore, CA 94550  
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6320 San Ignacio Avenue  
San Jose, CA 95119  
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Phone: (408) 229-6150  
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### **B. Background**

At the time the CRADA was established, Silicon Video Corporation, of Cupertino, CA was a one-year-old rapidly growing start-up company. SVC was developing flat panel displays (FPDs) to replace Cathode Ray Terminals (CRTs) for personal computers, work stations and televisions. They planned to base their products on low cost and energy efficient field emission technology. It was universally recognized that the display was both the dominant cost item and differentiating feature of many products such as laptop computers and hand-held electronics and that control of the display technology through U.S. sources was essential to success in these markets.

### **C. Description**

The purpose of this CRADA project was to determine if electrochemical planarization would be a viable, inexpensive alternative to current optical polishing techniques for planarizing the surface of a ceramic backplate of a thin film display.

Silicon Video provided alumina substrates that would undergo the LLNL-developed electrochemical planarization process. LLNL sputter-deposited metal onto the rough substrate and then electroplated and electropolished it using the electrochemical planarization process. LLNL also fabricated row electrodes that were electrically tested by the Silicon Video Corporation. LLNL evaluated the validity of the concept and provided Silicon Video with a final report with the findings.

**D. Expected Economic Impact**

Silicon Video expected to realize an enhanced future productivity in fabricating its FPDs. This would result in increased competitiveness, while lowering the future costs for fabricating these flat panel displays.

**E. Benefits to DOE**

LLNL developed a better understanding as to how their electrochemical planarization process could be applied in the existing FPD marketplace. This included a better understanding of FPD manufacturing and FPD competing technologies. Through the application of the planarization process, LLNL expected to develop a new technique for their process while further enhancing other LLNL core technologies such as field emission, vacuum sealing, and interconnection technologies.

Transfer of the electrochemical planarization technology developed at LLNL to Silicon Video Corporation would help to satisfy DOE's goal of transferring National Laboratory technology to U.S. industry.

**F. Industry Area**

Computer Hardware

**G. Project Status**

This project is completed.

**H. LLNL Point of Contact for Project Information**

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7000 East Avenue, L-795  
Livermore, CA 94550  
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Principal Investigator  
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Fax: (925) 423-6785

**I. Company Size and Point(s) of Contact**

Candescent Technologies Corporation  
6320 San Ignacio Avenue  
San Jose, CA 95119  
Ted Fahlen  
Tel: (408) 229-6150  
Fax: (408) 229-0664

**J. Project Examples**

There are no project examples.

**K. Subject Inventions**

This small value contractual mechanism did not anticipate any generation of Intellectual Property (IP) including subject inventions. The LLNL contributors and the company participants both indicate that no new intellectual property was generated.

**L. Release of Information**

I certify that all information contained in this report is accurate and releasable to the best of my knowledge.

Karena McKinley  
Karena McKinley, Director  
Industrial Partnerships  
and Commercialization

10/17/00  
Date

**Release of Information**

I have reviewed the attached Project Accomplishment Summary prepared by Lawrence Livermore National Laboratory and agree that the information about our CRADA may be released for external distribution.

Ted Fahlen  
Ted Fahlen  
Candescent Technologies Corporation

10-2-00  
Date